

CA20N  
EAB  
-0 53

# ENVIRONMENTAL ASSESSMENT BOARD



## ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARINGS

---

VOLUME: 110

DATE: Wednesday, February 19, 1992

BEFORE:

HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

---

**FARR**  
ASSOCIATES &  
REPORTING INC.

(416) 482-3277

2300 Yonge St. Suite 709 Toronto, Canada M4P 1E4



ENVIRONMENTAL ASSESSMENT BOARD  
ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARING

IN THE MATTER OF the Environmental Assessment Act,  
R.S.O. 1980, c. 140, as amended, and Regulations  
thereunder;

AND IN THE MATTER OF an undertaking by Ontario Hydro  
consisting of a program in respect of activities  
associated with meeting future electricity  
requirements in Ontario.

Held on the 5th Floor, 2200  
Yonge Street, Toronto, Ontario,  
on Wednesday, the 19th day of February,  
1992, commencing at 10:00 a.m.

-----  
VOLUME 110  
-----

B E F O R E :

THE HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

S T A F F :

MR. M. HARPUR	Board Counsel
MR. R. NUNN	Counsel/Manager, Information Systems
MS. C. MARTIN	Administrative Coordinator
MS. G. MORRISON	Executive Coordinator





A P P E A R A N C E S

B. CAMPBELL	)	ONTARIO HYDRO
L. FORMUSA	)	
B. HARVIE	)	
J.F. HOWARD, Q.C.	)	
J. LANE	)	
G. A. KARISH	)	
J.C. SHEPHERD	)	IPPSO
I. MONDROW	)	
J. PASSMORE	)	
R. WATSON	)	MUNICIPAL ELECTRIC
A. MARK	)	ASSOCIATION
S. COUBAN	)	PROVINCIAL GOVERNMENT
P. MORAN	)	AGENCIES
J. MacDONALD	)	
C. MARLATT	)	NORTH SHORE TRIBAL COUNCIL,
D. ESTRIN	)	UNITED CHIEFS AND COUNCILS
		OF MANITOULIN, UNION OF
		ONTARIO INDIANS
D. POCH	)	COALITION OF ENVIRONMENTAL
D. STARKMAN	)	GROUPS
D. ARGUE	)	
T. ROCKINGHAM		MINISTRY OF ENERGY
B. KELSEY	)	NORTHWATCH
L. GREENSPOON	)	
P. McKAY	)	
J.M. RODGER		AMPCO
M. MATTSON	)	ENERGY PROBE
D. CHAPMAN	)	
A. WAFFLE		ENVIRONMENT CANADA
M. CAMPBELL	)	ONTARIO PUBLIC HEALTH
M. IZZARD	)	ASSOCIATION, INTERNATIONAL
		INSTITUTE OF CONCERN FOR
		PUBLIC HEALTH
G. GRENVILLE-WOOD		SESCI

Digitized by the Internet Archive  
in 2022 with funding from  
University of Toronto

<https://archive.org/details/31761114685548>

A P P E A R A N C E S  
(Cont'd)

D. ROGERS		ONGA
H. POCH	)	CITY OF TORONTO
J. PARKINSON	)	
R. POWER		CITY OF TORONTO, SOUTH BRUCE ECONOMIC CORP.
S. THOMPSON		ONTARIO FEDERATION OF AGRICULTURE
B. BODNER		CONSUMERS GAS
J. MONGER	)	CAC (ONTARIO)
K. ROSENBERG	)	
C. GATES	)	
W. TRIVETT		RON HUNTER
M. KLIPPENSTEIN		POLLUTION PROBE
N. KLEER	)	NAN/TREATY #3/TEME-AUGAMA
J. OLTHUIS	)	ANISHNABAI AND MOOSE RIVER/
J. CASTRILLI	)	JAMES BAY COALITION
T. HILL		TOWN OF NEWCASTLE
M. OMATSU	)	OMAA
B. ALLISON	)	
C. REID	)	
E. LOCKERBY		AECL
C. SPOEL	)	CANADIAN VOICE OF WOMEN
U. FRANKLIN	)	FOR PEACE
B. CARR	)	
F. MACKESY		ON HER OWN BEHALF
D. HUNTER	)	DOFASCO
M. BADER	)	
B. TAYLOR	)	MOOSONEE DEVELOPMENT AREA
D. HORNER	)	BOARD AND CHAMBER OF
H. WATSON	)	COMMERCE





A P P E A R A N C E S

(Cont'd)

T. HEINTZMAN	)	ATOMIC ENERGY OF CANADA
D. HAMER	)	
C. FINDLAY	)	
P.A. NYKANEN	)	CANADIAN MANUFACTURERS ASSOCIATION - ONTARIO
G. MITCHELL		SOCIETY OF AECL PROFESSIONAL EMPLOYEES
S. GOUDGE		CUPE
D. COLBORNE		NIPIGON ABORIGINAL PEOPLES' ALLIANCE



I N D E X   o f   P R O C E E D I N G S

	<u>Page No.</u>
<u>ARTHUR RAYMOND EFFER,</u> <u>CHARLES WILLIAM DAWSON,</u> <u>JAMES RICHARD BURPEE,</u> <u>GARY NEIL MEEHAN,</u> <u>JOHN DOUGLAS SMITH,</u> <u>AMIR SHALABY; Resumed.</u>	19202
Cross-Examination by Mr. Watson	19235





L I S T o f E X H I B I T S

<u>No.</u>	<u>Description</u>	<u>Page No.</u>
479	Excerpts from various Hydro documents, interrogatories and other reports.	19234
475.3	Interrogatory No. 2.7.50.	19254
475.4	Interrogatory No. 8.9.45.	19269
475.5	Interrogatory No. 8.9.51.	19275
475.6	Interrogatory No. 8.9.54.	19283
475.7	Interrogatory No. 8.9.41.	19305
475.8	Interrogatory No. 8.9.40.	19307



L I S T o f U N D E R T A K I N G S

No.	Description	Page No.
478.1	Ontario Hydro undertakes to provide what elements are included in the routine analysis and to include any analysis of radioactive constituents in the leachate.	19208
478.2	Ontario Hydro undertakes to provide any documentation of PCBs, along with any information as to their toxicology.	19217
478.3	Ontario Hydro undertakes to provide how mothballing is dealt with by the accountants, and with reference to the Hearn plant.	19229
478.4	Ontario Hydro undertakes to provide any studies studies that show cycling is not a problem with respect to life extension.	19246
478.5	Ontario Hydro undertakes to provide an estimate of what it would cost to bring units 1, 2, 5 and 6 up to full reliability, and whether the figure of one billion five hundred and twenty million dollars for the second set of four units has changed.	19265
478.6	Ontario Hydro undertakes to provide specific examples of reasons for increased work and costs for Units 5 and 6 at Lakeview.	19280
478.7	Ontario Hydro undertakes to produce the reliability content for No. 1150 and No. 805.	19291





TIME NOTATIONSPage No.

	10:01 a.m.	-----	19202
	10:10 a.m.	-----	19207
	10:22 a.m.	-----	19213
	10:35 a.m.	-----	19223
	10:53 a.m.	-----	19233
	11:15 a.m.	-----	19246
Recess	11:30 a.m.	-----	19257
Resume	11:46 a.m.	-----	19257
	12:07 p.m.	-----	19274
	12:29 p.m.	-----	19288
	12:50 p.m.	-----	19302
Adjourned	1:00 p.m.	-----	19310



1 ---Upon commencing at 10:01 a.m.

2 THE REGISTRAR: Please come to order.

3 This hearing is now in session. Please be seated.

4 THE CHAIRMAN: Dr. Connell has some  
5 questions.

6 ARTHUR RAYMOND EFFER,  
7 CHARLES WILLIAM DAWSON,  
8 JAMES RICHARD BURPEE,  
9 GARY NEIL MEEHAN,  
JOHN DOUGLAS SMITH,  
AMIR SHALABY; Resumed.

10 DR. CONNELL: My question goes to concern  
11 108. I haven't had to do all my homework on volume 109  
12 yet. Perhaps later.

13 Dr. Effer, I wonder if I could take up  
14 with you the issue of the modelling of acid gas  
15 deposition. You dealt with this in Volume 108 on page  
16 18870, and you made special reference to the patterns  
17 of deposition in the Muskoka Lakes area.

18 In these models, were you looking at  
19 accumulated depositions over a full annual cycle, or  
20 over a period of several years?

21 DR. EFFER: Dr. Connell, the basic data  
22 that goes into these models is to take a year's  
23 meteorological data and use that to assimilate the  
24 deposition patterns.

25 DR. CONNELL: Within the year, I presume

1       you would occasionally get some anomalous weather  
2       patterns, would you, that would give you quite  
3       distinctive deposition patterns in the short run?

4                     DR. EFFER: That is correct, yes.

5                     DR. CONNELL: For example, could it  
6       happen in the case of an inversion or some other  
7       phenomenon that, say, at the Lakeview Plant, you would  
8       get especially heavy deposition in the local region?

9                     DR. EFFER: Yes, that's true.

10                    DR. CONNELL: Over a limited time period,  
11       could that be much higher, tenfold or one hundredfold  
12       or one thousandfold higher than the annual average?

13                    DR. EFFER: I can't be precise about what  
14       the factor would be. I'm afraid not.

15                    DR. CONNELL: If we take your figure in  
16       the Muskoka Lakes area that Hydro's acid gas  
17       contributes, on the average, 6 per cent, it is  
18       conceivable that in a particular time period it might  
19       be much higher 6 and on some other occasions it might  
20       be lower than 6; is that correct?

21                    DR. EFFER: That's correct, yes.

22                    DR. CONNELL: I would like to turn to  
23       flyash for a few minutes. This you introduced on page  
24       18903, and perhaps we could look at overhead E8 in  
25       Exhibit 470.



1                   On page 18904, in your response at line  
2           21, you reported findings that:

3                   Coal flyash is not hazardous, as  
4                   determined by Regulation 309.

5                   This means, as I understand your  
6           evidence, that the leachate does not exceed ten times  
7           the level shown in schedule 4, that is in the first  
8           column of figures, for any of the elements shown in the  
9           table, is that correct?

10                  DR. EFFER: That's correct.

11                  DR. CONNELL: As you describe that test  
12           on page 18903 on line 19:

13                  The ash is contacted with water - it  
14                  is essentially in a column - and the  
15                  water is falling from the column, at the  
16                  bottom of the column. When it is  
17                  dissolved, the soluble material is called  
18                  the leachate.

19                  Can you just give me a little more  
20           detail? I would be interested in the kinetics of that  
21           process. How long is the ash exposed to the solvent in  
22           that test?

23                  DR. EFFER: I can't give you any details  
24           of that I'm afraid.

25                  DR. CONNELL: You say later that the

1 flyash cannot be used for lake filling -- sorry, I've  
2 lost the page reference here. Oh, here we are -- no,  
3 that's cement stabilized.

4 Well, let's just take that as given, that  
5 flyash cannot be used for lake filling. I just wonder  
6 then, as I understand the situation at Nanticoke, as we  
7 saw it in our visit, and this may be true at the other  
8 stations, too, the ash deposits are in fact right  
9 beside the lake, and I think it can be assumed, can it  
10 not, that the leachate from the ash pile will find its  
11 way into ground water and into the lake?

12 DR. EFFER: The run off from the ash pond  
13 area is monitored and is treated and analyzed before it  
14 is released to the lake.

15 DR. CONNELL: I see. How is it  
16 collected? There is some means of collecting the run  
17 off then; is there?

18 DR. EFFER: Yes.

19 DR. CONNELL: I don't think that was made  
20 evident to us when we visited the plant.

21 MR. DAWSON: Maybe I could interject  
22 something here, Dr. Connell. In fact you may recall  
23 that there is a lagoon at the back of the ash pile--

24 DR. CONNELL: Yes.

25 MR. DAWSON: --where the decanted water

1 that is used to transport the ash to the pile is  
2 returned and allowed to settle--

3 DR. CONNELL: Yes.

4 MR. DAWSON: --before that is returned to  
5 the lake, and I think any run off from the ash pile  
6 also collects in that same lagoon and is settled and  
7 allowed to settle in that lagoon, too.

8 DR. CONNELL: So in the event of heavy  
9 rain, there would be run off into the --

10 MR. DAWSON: That's right, yes. -

11 DR. CONNELL: Yes.

12 MR. DAWSON. You also mentioned leachate,  
13 and we do have ground water monitoring wells around the  
14 pile and that information is reported to the Ministry  
15 of Environment on an annual basis, I believe.

16 DR. CONNELL: Dr. Effer, when you said  
17 that the run off is treated, what did you mean? In  
18 what way is it treated? And in what circumstances?

19 DR. EFFER: One of the main things, as  
20 Mr. Dawson has said, is that suspended matter is  
21 allowed to settle out.

22 DR. CONNELL: I see. You are not aware  
23 of any instance in which one of the toxic ingredients  
24 has been found in unusually high concentration?

25 DR. EFFER: I can't give any details of

1       that, I am sorry.

2                   DR. CONNELL:  If we compare your overhead  
3       E8 with E11, the air toxics, I notice that there are a  
4       number of elements in E11 which don't appear on E8.  In  
5       fact, these are antimony, beryllium, bromine, cobalt,  
6       copper, iron, manganese, thorium, titanium, vanadium  
7       and zinc are all on E11 but not on E8.

8                   Why would they not be included in  
9       regulation 309?  There are three actually on E8 that  
10      don't appear on E11.  These are cyanide, nitrate and  
11      nitrite.

12                  DR. EFFER:  I can't explain why there is  
13      this disparity between the two listings.  
14      [10:10 a.m.]

15                  DR. CONNELL:  I take it that those cited  
16      in E11 not on E8 would not be monitored in the leachate  
17      then; is that correct?

18                  DR. EFFER:  I believe the analysis that  
19      is carried out would be able to detect a much larger  
20      number of elements than is expressed in that list  
21      headed Constituent in E8.

22                  DR. CONNELL:  May I ask you to confirm  
23      that for me, what elements are included in the routine  
24      analysis?

25                  DR. EFFER:  I think we could provide



1       that information, yes.

2                     DR. CONNELL: Thank you.

3                     THE CHAIRMAN: Perhaps we should put that  
4       as the first undertaking.

5                     THE REGISTRAR: That would be 478.1.

6                     THE CHAIRMAN: Thank you.

7       ---UNDERTAKING NO. 478.1: Ontario Hydro undertakes to  
8                     provide what elements are included in the  
9                     routine analysis and to include any  
                    analysis of radioactive constituents in  
                    the leachate.

10                    DR. CONNELL: I just made a short list of  
11       other elements that don't appear on other lists such as  
12       chlorine, iodine, strontium, caesium, radium, polonium,  
13       so perhaps if they could be considered too.

14                    I don't think you made any reference to  
15       radioactivity in general in coal or ash, although you  
16       do, uranium is included in the table and thorium is  
17       included in Ell, but could you comment on radioactive  
18       constituents? Is this a serious hazard?

19                    DR. EFFER: I believe we have a more  
20       detailed breakdown of constituents of ash in one of the  
21       exhibits. I think we have covered it in 468, Health  
22       and Environmental Effects, but I am not certain about  
23       that.

24                    DR. CONNELL: Perhaps if I could ask you  
25       in the same undertaking to include any analysis of

1 radioactive constituents in the leachate.

2 On page 18874 your evidence dealt with  
3 ozone production. You referred to drawing down of  
4 ozone from the upper atmosphere, the emission from  
5 vegetation, thunderstorms and lightening. And on line  
6 14, man made NOx and volatile organic compounds.  
7 Continuing down below, line 23, NOx and VOC interact  
8 with the natural atmospheric processes, in atmospheric  
9 processes to increase ozone levels.

10 Is this latter phenomenon, that is the  
11 NOx and VOCs, is that an important contributor to ozone  
12 production? I am sure it's variable from time to time  
13 and place to place, but overall are we talking a  
14 significant contribution to ground level ozone?

15 DR. EFFER: Yes, Dr. Connell, I think you  
16 are correct in saying that it would be very variable,  
17 and in some situations and in some locations it would  
18 become a very high contributor to the ground air ozone  
19 level.

20 DR. CONNELL: Are you familiar with the  
21 chemistry of that process, what are the reactive  
22 species?

23 DR. EFFER: I am familiar inasfar as I  
24 can recall seeing one of these diagrams and I am aware  
25 that it is an extremely complex cycling of complex

1 compounds in the atmosphere. I wouldn't be able to  
2 talk to the processes in detail.

3 DR. CONNELL: Is it your understanding  
4 that both NOx and VOC are required?

5 DR. EFFER: Yes, that is correct.

6 DR. CONNELL: Yes. And is molecular  
7 oxygen involved too?

8 DR. EFFER: Yes, that is correct.

9 DR. CONNELL: And there is catalysis by  
10 light, I take it?

11 DR. EFFER: By ultraviolet light, yes.

12 DR. CONNELL: Yes. So the production of  
13 ozone would be alleviated if NOx and VOCs were  
14 separated, or if either constituent was reduced in  
15 concentration, or if they were rapidly disbursed or  
16 diluted upon emission. That all follows from your  
17 observation, I take it?

18 DR. EFFER: In a general sense, yes.

19 The interaction of NOx and VOCs is -- or  
20 what is rate limiting, which of the two is rate  
21 limiting in any particular situation depends on the  
22 relative concentrations of each. And again, depending  
23 on those relative concentrations, one would be limiting  
24 the rate of reaction to ozone, in another range of  
25 concentrations the other component will be limiting the

1 rate of production of ozone.

2 This has been extensively researched and  
3 there are diagrams and rate constants and things  
4 available.

5 DR. CONNELL: Yes. But if there were  
6 some way of bringing about a very major dilution of the  
7 concentration in the air, say, by an order of one  
8 hundredfold, the importance of that reaction would be  
9 enormously diminished since the concentrations of at  
10 least two of the reactivate species would be diminished  
11 simultaneously, presumably.

12 DR. EFFER: I believe that might be the  
13 case theoretically. I am not sure in practice what  
14 would happen.

15 DR. CONNELL: I would like to ask about  
16 selective catalytic reduction. What is the catalyst?

17 MR. DAWSON: The catalyst can vary with  
18 the manufacturer and the exact composition is  
19 propriety. I don't know precisely what the catalyst  
20 is, but I do know that there are vanadium oxides,  
21 molybdenum oxides. I am trying to think, there is a  
22 third element in there and I am not sure precisely what  
23 it is, Dr. Connell.

24 DR. CONNELL: Does the catalyst have to  
25 be replaced periodically?

1 MR. DAWSON: Yes. Catalyst life on a  
2 coal-fired application is typically in the range of  
3 three to five years, and after that period of time you  
4 will start to see the NOx reduction performance  
5 deteriorate. And typically what happens is that you  
6 add additional catalyst rather than replacing it  
7 outright and then later on ultimately we will remove  
8 catalyst and replace catalyst, but initially you leave  
9 room to add catalyst into the reactor.

10 DR. CONNELL: Is there a disposition  
11 problem? Where does the used catalyst go?

12 MR. DAWSON: No. I think it is normally  
13 the front end of the catalyst bed that would tend to  
14 deteriorate fastest, it would see more of the flyash.  
15 In fact, one of the problems tends to be an  
16 accumulation of flyash on the front end of the catalyst  
17 which can also upset the gas distribution through the  
18 catalyst tube.

19 DR. CONNELL: But are we talking about  
20 substantial amounts of vanadium, or whatever it is, or  
21 are we talking a metric tonne or two or are we talking  
22 a very small quantities.

23 MR. DAWSON: I think overall the total  
24 mass of catalyst, typically, in a 500 megawatt reactor  
25 would be something like 3,000 tonnes. But the catalyst



1 is in fact deposited on a metal screen which forms a  
2 base and the structure for the catalyst and it is  
3 applied as mixture in a clay. I don't know precisely  
4 what percentage of vanadium is in that clay. As I say,  
5 I think those values, the exact mix is propriety and I  
6 am not sure whether we could tell you what percentage  
7 of vanadium and molybdenum is present in that clay, but  
8 I suspect it is in the order after few per cent of the  
9 total.

10 DR. CONNELL: On Ell vanadium appears as  
11 one of the air toxics, could any of that vanadium be  
12 from your SCR units?

13 MR. DAWSON: I am not sure what the -- is  
14 that from the environmental assessment?

15 If this is a North American source, then  
16 I don't think any of that vanadium would be from SCR  
17 units because there are virtually no SCR units applied  
18 to coal plants in North America right now.

19 [10:22 a.m.]

20 DR. CONNELL: I see.

21 MR. DAWSON: The only place they are  
22 applied to coal plants is in Japan and Germany as of  
23 today.

24 But I think there is a potential for a  
25 small increase in vanadium, because you will tend to

1 see a little bit of erosion as a result of the flyash  
2 passing through the catalyst bed, and that will  
3 therefore tend to increase the -- but you have got to  
4 remember that that is upstream of the electrostatic  
5 precipitator, so you will also tend to remove it in the  
6 electrostatic precipitator and in the scrubber, if  
7 there is a scrubber on the back end of the plant, too.

8 DR. CONNELL: Right. Could one of the  
9 panelists give me a little more insight into how flue  
10 gas conditioning works?

11 MR. DAWSON: Yes, I guess I should deal  
12 with that.

13 If you start off by thinking about an  
14 individual flyash particle, it has an electrical  
15 resistivity, and if that resistivity is too high, as it  
16 tends to be with low sulphur coals, then as the deposit  
17 of ash builds up on the collection plate that I  
18 described, inside the precipitator, it builds up an  
19 insulating layer essentially and interferes with the  
20 corona discharge that in fact charges the particles.  
21 What happens is it ultimately causes a spark to occur  
22 and you get a breakdown in the corona.

23 Essentially you have got a non-ideal  
24 situation when that is happening, you are only  
25 collecting during the periods in between the sparks,

1 and the sparking rate tends to become very high. So  
2 flue gas conditioning essentially injects a small  
3 amount of sulphur trioxide into the gas, and that  
4 reacts with the alkaline elements on the flyash  
5 particle, and it creates a surface layer of, typically,  
6 calcium sulphate which is conductive, and that tends to  
7 correct the resistivity problem. It brings the ash  
8 resistivities down to the ideal range, which is about  
9 10 to the 10th, 10 to the 11th ohms per centimetre.  
10 That's the ideal ash resistivity.

11 So by doing that, it corrects the  
12 problem, brings the ash resistivity back down to the  
13 correct range and allows you to optimize precipitator  
14 performance again.

15 DR. CONNELL: Thank you.

16 MR. DAWSON: The other thing you can do  
17 is add ammonia, and that is done when you have got the  
18 opposite problem and you have got too low an ash  
19 resistivity. That typically happens if you have got a  
20 lot of unburned carbon in the ash, and the ammonia  
21 forms ammonium bisulphite, I think, which is a very  
22 long, stringy, crystal, and it's also sticky, and that  
23 simply tends to bond anything that is collected on the  
24 plate. It bonds it there, holds it there, and prevents  
25 it from re-entraining back into the gas stream, which

1 happens when you have got too low an ash resistivity.  
2 So there are the two things and we have used both of  
3 those techniques at Nanticoke and at Lambton.

4 DR. CONNELL: Thank you.

5 On page 18889, this is, I think, Dr.  
6 Effer's testimony, line 11, we have a series of  
7 compounds that react with chlorine. Is that what you  
8 meant, or did you mean that are derivatives of  
9 chlorine?

10 DR. EFFER: I think you are correct, Dr.  
11 Connell. I think that the term derivative would be  
12 more appropriate.

13 DR. CONNELL: I suppose they might well  
14 react with chlorine, but that's probably not the  
15 property you meant to call attention to.

16 DR. EFFER: I think there is some  
17 reformation of reactive elements that can take place in  
18 some situations to produce the chlorinated products.

19 DR. CONNELL: You may well have an  
20 interrogatory that deals with this matter. Can you  
21 provide any documentation of the varieties of PCBs and  
22 dioxins that are of most concern to you?

23 DR. EFFER: At the moment I can't recall  
24 any more detail. There is something there, I think,  
25 that we can pick up.

1 DR. CONNELL: If you have access to any  
2 documentation of the species, I would be interested to  
3 see it, along with any information as to their  
4 toxicology.

5 Perhaps I could make that an undertaking.

6 THE CHAIRMAN: That will be No. 2  
7 undertaking. Is it 478?

8 THE REGISTRAR: 478.2.

9 ---UNDERTAKING NO. 478.2: Ontario Hydro undertakes to  
10 provide any documentation of PCBs,  
11 along with any information as to  
12 their toxicology.

12 DR. CONNELL: I have a note, although I  
13 don't have a page reference, that CTUs are more  
14 efficient in winter. Does someone recall that  
15 evidence?

16 MR. DAWSON: Yes, I think I made that  
17 comment, Dr. Connell.

18 DR. CONNELL: This prompts me to ask, is  
19 it not possible to achieve the same affect by cooling  
20 exhaust gases? Why is that not done?

21 MR. DAWSON: Well, it's not the exhaust  
22 gases. It is the mass flow through the combustion  
23 turbine unit that effects the output.

24 It is simply the fact that in colder  
25 weather the density of the air is higher, and therefore



1       you get more pounds of air through the turbine, because  
2       the compressor performance is improved because the air  
3       is cold. So that is the effect that we are looking at,  
4       and it has quite a significant effect on the gas  
5       turbine output.

6                 DR. CONNELL: I see. You couldn't gain  
7       efficiency by cooling at the exhaust end?

8                 MR. DAWSON: We do that by recovering  
9       heat from the back end of the gas turbine and  
10      converting it into steam and building the  
11      combined-cycle unit essentially and in fact, yes, that  
12      increases the turbine efficiency.

13                DR. CONNELL: Yes. In the absence --

14                MR. DAWSON: Combined-cycle rather than a  
15      simple gas turbine unit.

16                DR. CONNELL: In the absence of the steam  
17      cycle, it simply wouldn't pay to cool it?

18                MR. DAWSON: No, it's just a matter of  
19      economic trade off, I think.

20                DR. CONNELL: I think it was Mr. Meehan  
21      that was testifying about life extension and life  
22      management programs?

23                MR. MEEHAN: Yes.

24                DR. CONNELL: Can you tell me when plans  
25      will be firm with respect to the light management

1 programs, and the introduction of pollution control  
2 measures? Are we looking at several years of further  
3 planning?

4 MR. MEEHAN: I think we are looking at  
5 several years. If that is your question, I think Mr.  
6 Burpee here would be --

7 Is it with respect to the addition of the  
8 environmental control equipment that you are asking  
9 about?

10 DR. CONNELL: Well, both really.

11 MR. MEEHAN: The combustion process  
12 modifications that are part of that whole package now  
13 at Lambton, we expect to have those committed by summer  
14 this year. That is the \$100 million expenditure at  
15 Lambton.

16 If we are to keep on the schedule of  
17 having the second pair of scrubbers installed at  
18 Lambton by 1997, we would also have them committed  
19 about one year from now. That is the only thing that  
20 is at the point that I am involved in trying to  
21 rationalize and assess in a detailed way, proceeding  
22 with those projects.

23 We have the pilot project. It is for the  
24 SCRs that is just getting kicked off now, but the main  
25 project won't be started for several years. That would



1 see those facilities going into Nanticoke in about  
2 1999.

3 The other thing, I guess, is the gas at  
4 Lennox. We are doing the preliminary work now that  
5 could see a decision made in the fall of '92, fall of  
6 this year for that facility, if it's decided to put the  
7 gas in there.

8 DR. CONNELL: Just to take a hypothetical  
9 case, suppose you came to the conclusion that you were  
10 going to install scrubbers something on the scale of  
11 the Lambton conversion at the age of 40. Can you  
12 speculate as to how many years of life expectancy you  
13 would have to have beyond 40 to justify that?

14 MR. MEEHAN: To justify it economically,  
15 I would have to guess at that, but I think you would  
16 want to see 15 years of life, if you installed them at  
17 year 40.

18 DR. CONNELL: Yes.

19 MR. MEEHAN: In the order of I would  
20 think more than ten years.

21 DR. CONNELL: Yes. So there might be,  
22 just for that reason alone, good reason to look at  
23 earlier installation?

24 MR. MEEHAN: That would be one reason,  
25 yes.

1 DR. CONNELL: If you were going to do it,  
2 to do it before 40. I think you suggested that in your  
3 evidence?

4 MR. MEEHAN: Yes, and that is to do with  
5 an orderly installation program. I don't think we  
6 could add 12 scrubbers, for instance, or 12 SCRs all in  
7 a short period of time. And we would reap the  
8 environmental benefits by doing it earlier.

9 DR. CONNELL: Yes. I think that deals  
10 with my main concern. I don't know if you have  
11 anything to add, Mr. Burpee.

12 MR. BURPEE: I was just going to add in  
13 terms of life management, the actual program  
14 requirements are going into the business plan, which is  
15 being prepared, the process just started in the last  
16 few weeks, which is for the period 1993 to 2002. That  
17 is our ten-year cycle. We will be requesting  
18 sufficient funding for a life management inspection  
19 program. It will take two or three years to get a  
20 better idea on future reinvestment rates and the format  
21 it will take.

22 That is not to say we have not been doing  
23 inspections in the past, but they have been driven by  
24 safety concerns, component integrity. This is, as I  
25 said, looking forward to getting a better handle on

1 reinvestment rates.

2 DR. CONNELL: Mr. Meehan, there was one  
3 part of your evidence that I didn't really follow.  
4 This is beginning on 18924, dealing with the life  
5 extension, and perhaps we could refer to Exhibit 471,  
6 page M6.

7 MR. MEEHAN: Excuse me, Dr. Connell, is  
8 that page 18924?

9 DR. CONNELL: Yes. And you point out  
10 over on 925 that there is 4,300 megawatts of existing  
11 fossil generation, which was assumed to retire in the  
12 DSP, that is not assumed to retire in the Update.

13 So, looking at M6, over on the extreme  
14 right-hand side at 2014, I take it that the difference  
15 between the dotted line labeled "DSP Update" and the  
16 solid line labeled "DSP 1989," is the 4300 megawatts?

17 MR. MEEHAN: That's exactly correct.

18 DR. CONNELL: Right. Now the part that I  
19 didn't follow, it didn't seem to me to follow from your  
20 evidence, was at the top of 926, that the initial need  
21 date for new generation might be deferred one year by  
22 this change. It just seems to me intuitively that a  
23 difference of 4,300 megawatts should have an impact on  
24 a need date of more than one year. I just wonder if I  
25 misunderstood you?

1                   MR. MEEHAN: I was referring to the  
2           initial need date for the first new generating  
3           facility. If we had stayed with the old assumptions,  
4           we would have needed that first generating unit  
5           in-service in 2010, I believe, and then we would have  
6           installed them a year at a time after that,  
7           approximately.

8           [10:35 a.m.]

9                   But if we assume that the retirements are  
10          as they are in the 1992, we would install them -- I'm  
11          sorry, I think I am a little mixed up.

12                   We would install the first unit just one  
13          year later. We would have to install them more rapidly  
14          after that. But in planning generation facilities the  
15          initial date of in-service is an important event, I  
16          guess, from our perspective, and it would only move by  
17          one year. We would have to install more of them more  
18          quickly after that in order to make up the 4,300  
19          megawatts in a five-year period.

20                   MR. SHALABY: The need date is the  
21          intersection between the time you need something, the  
22          intersection between demand and supply. When you run  
23          out of supply the two lines intersection, that we call  
24          the need date. Then the amount you need is how much  
25          gap develops after that.

1                   So the 4,300 is indicative of how much  
2     you will need once the intersection incurs. But the  
3     need date simply indicates when is it that you start  
4     suffering reliability degradation, intersection between  
5     reliable supply and demand.

6                   DR. CONNELL: We don't have an  
7     illustration of the rate of introduction of new supply  
8     in the update scenario, do we?

9                   MR. MEEHAN: It can't really be seen from  
10    this figure, I don't think, but it is in the update  
11    report which is Exhibit 452.

12                  DR. CONNELL: Yes. The page reference  
13    is?

14                  MR. MEEHAN: On page 14. The thing that  
15    Mr. Shalaby was describing is shown there on page 14.

16                  DR. CONNELL: Right.

17                  MR. MEEHAN: If you go to the right side  
18    of the figure to where it says median need date, the  
19    arrow is pointing at 2010, and that is where the supply  
20    curve, which is the humped curve, is intersecting with  
21    the demand curve that is going upwards.

22                  DR. CONNELL: Right.

23                  MR. MEEHAN: So that is what I was  
24    referring to as the initial need date.

25                  The 4,300 megawatts is represented by the



1 gap between those two lines at the far right end of the  
2 figure.

3 If these retirements do or don't occur,  
4 that is the Lambton and the Nanticoke assumptions, it  
5 would only move the need date by one year on that  
6 figure. The shape of the available supply line would  
7 drop more quickly than is shown there, but the date  
8 would only advance one year. That was the point I was  
9 trying to make.

10 DR. CONNELL: So this figure 7-1, it is  
11 consistent within M6, is it?

12 MR. MEEHAN: Yes.

13 DR. CONNELL: But isn't M6 telling us  
14 that those 4,300 megawatts are still in-service in  
15 2014?

16 MR. MEEHAN: Yes.

17 DR. CONNELL: So the decline in available  
18 supply that starts in 2008, that decline doesn't  
19 include these 4,300 megawatts?

20 MR. SHALABY: The decline would be  
21 steeper if the 4,300 megawatts were also retired. That  
22 decline would be steeper still. I think that is the  
23 point.

24 DR. CONNELL: I see. So the line in  
25 figure 7-1 called Available Supply would start to drop

1 off at the same point, but it would--

2 MR. SHALABY: One year ahead but opens  
3 up --

4 DR. CONNELL: --cross the line a year  
5 earlier.

6 MR. SHALABY: That's correct.

7 DR. CONNELL: And then fall off rather  
8 steeply.

9 MR. SHALABY: That's correct.

10 MR. MEEHAN: I guess it would be 4,300  
11 megawatts lower at the end of that period.

12 DR. CONNELL: Right. Thank you, that  
13 helps me.

14 THE CHAIRMAN: Am I right that we should  
15 be looking at - I don't think it changes this  
16 discussion - but we should be looking at figure 7-1 on  
17 page 8 of 452A, which is a revision of the figure on  
18 page 14 in 452?

19 I don't think it changes the discussion;  
20 I think it is a different slope on some of the curves.

21 MR. SHALABY: There have been some  
22 corrections to the numbers in the update, to the  
23 update, it is probably more accurate.

24 MR. HOWARD: Mr. Chairman, do you have a  
25 No. 452A for this Data for Figures? Because if it got



1 a number, it didn't get in my notes. I think it would  
2 of useful, it's been distributed widely to the parties  
3 who are interested.

4 THE CHAIRMAN: Mine is marked Exhibit  
5 452A.

6 MR. HOWARD: Well, if yours is marked I  
7 had better mark mine.

8 MR. SHALABY: There is one correction to  
9 that figure, this is now the third layer of  
10 corrections.

11 THE CHAIRMAN: Just hold it, Mr. Shalaby.  
12 My document is titled, Data for Figures  
13 of Exhibit 452, Demand/Supply Update 1992, it's dated  
14 January 28, 1992.

15 MR. HOWARD: That's the one.

16 MR. SHALABY: Yes.

17 THE CHAIRMAN: Mr. Shalaby, I'm sorry to  
18 interrupt you.

19 MR. SHALABY: Figure 7-1, at the  
20 intersection, the second intersection erroneously says  
21 lower need date; it should be median need date.

22 So we fixed one thing and we blew  
23 another.

24 THE CHAIRMAN: Can I fix something else?

25 MR. SHALABY: Yes, go ahead.

1                   THE CHAIRMAN: There are four lines shown  
2 on the document and there are only three markings for  
3 them. I take it that looking at the right-hand side,  
4 the second line from the bottom is the LMC; is that  
5 right?

6                   MR. SHALABY: Yes. Or the language used  
7 in the previous figure is available supply, yes.

8                   MR. HOWARD: You can keep that if you put  
9 452A on the front of it and give it back.

10                  DR. CONNELL: Mr. Meehan, one more  
11 question about mothballing, 18919, although my question  
12 is not really relevant to your evidence. But I would  
13 be interested to know when a plant is mothballed, how  
14 that is dealt with by the accountants. Is it still  
15 shown as an asset on the balance sheet?

16                  MR. MEEHAN: I believe it is, but I am  
17 not too clear as to how it's depreciated. But I can  
18 say definitely that it is an asset. It is treated as  
19 an asset. It may not be depreciated, but it would  
20 amortized over a selected period of time.

21                  DR. CONNELL: Could I ask you to give me  
22 some more insight into that phenomenon, perhaps with an  
23 illustration with reference to, say, the Hearn plant?

24                  MR. MEEHAN: Certainly.

25                  DR. CONNELL: That would be very helpful.

1 THE CHAIRMAN: That would be No. 478.3.

2 ---UNDERTAKING NO. 478.3: Ontario Hydro undertakes to  
3 provide how mothballing is dealt with by  
4 the accountants, and with reference to  
5 the Hearn plant.

6 DR. CONNELL: Finally, Mr. Smith, with  
7 reference to your interesting account of the fuel  
8 purchasing strategy, I think we are all aware of the  
9 government's intervention with respect to the uranium  
10 fuel. Can you tell me whether there has been any  
11 intervention in fossil fuel purchasing by the  
12 Government of Ontario?

13 MR. SMITH: I don't believe there has  
14 been any direct intervention at this point in time,  
15 although you may have seen articles in the last two or  
16 three weeks where the recently resigned Minister of  
17 Energy suggested that Ontario Hydro would consider  
18 paying a premium for Canadian coal and to continue  
19 purchasing it. There hasn't been direct intervention  
20 but he did make a statement to that effect at a press  
21 deference in Thunder Bay about a month ago.

22 THE CHAIRMAN: He specified the premium  
23 15 per cent; is that right?

24 MR. SMITH: He said that we had a policy  
25 of paying 10 per cent for Canadian supplies and he  
would consider asking us to look at a premium of 15 per

1 cent. In fact, he was in error, Ontario Hydro has no  
2 policy to pay a premium for fuel supplies at this  
3 point. Fuel is an exception to our Canadian buying  
4 preference for other strategic reasons.

5 But his basic statement was that we  
6 currently are prepared to pay 10 percentage and he  
7 would consider asking to us look at 15 per cent. But  
8 that is the extent of any involvement.

9 DR. CONNELL: Thank you.

10 Those are my questions, Mr. Chairman.

11 MS. PATTERSON: I just have a few simpler  
12 questions.

13 First, Mr. Meehan, I think you talked  
14 about demothballing plants and you said it would take  
15 several years. Could you describe why it takes that  
16 long?

17 MR. MEEHAN: Well again, Mr. Burpee is  
18 probably the better person to ask, but let me try.

19 I think one of the main things is that  
20 they have to be staffed up. At Hearn, for instance,  
21 there is a large number of staff required to operate  
22 that station, so that it would take time to do that.

23 But there are also mechanical things that  
24 have to be done with the station as well. . Maybe Mr.  
25 Burpee will add to that I am sure.

1 MR. BURPEE: It doesn't always take  
2 several years. It depends how much preparedness you  
3 have done ahead of time, and that's one of the reasons  
4 at Hearn they are removing asbestos, one of the reasons  
5 they are removing asbestos now.

6 Staffing is an issue. It takes a while  
7 to get staff. When Lennox reopened we siphoned staff  
8 off from all the other existing stations and let them  
9 fend for themselves and refill back in.

10 There is equipment that has to come out.  
11 To be mothballed that has to be decommissioned, for  
12 virtually decommissioned, water line drained, vessels  
13 opened up, and absorbent materials put in. That all  
14 has to come out. Then check that the equipment is  
15 still in operating condition, and then there is a  
16 recommissioning process where you start to re-energize  
17 the systems.

18 I believe that both the Keith came out of  
19 mothballs at one point as has Lennox and they did find  
20 some deterioration of piping that had to be replaced,  
21 a few water heaters, things like that.

22 That would be the bulk of it, but it  
23 takes a while just to put a structure in there to have  
24 a management staff and then get people in to do it.  
25 There are some preplanned activities, like we have an



1 idea of what it takes but it's not overnight.

2 MS. PATTERSON: Thank you.

3 MR. SMITH: I might also add that  
4 depending on the station, fuel supply might be a  
5 constraining factor. Hearn, for example, was  
6 considered that fuel supply would probably be the  
7 biggest constraining factor to get natural gas supply  
8 re-established for Hearn in time for a restart.

9 MS. PATTERSON: Thank you.

10 Dr. Effer, Exhibit 470 is your overheads,  
11 and I was just wondering about page E5 for volatile  
12 organic compounds, and your chart shows 53.4 per cent  
13 of miscellaneous area sources and 4.75 per cent others.  
14 Could you give some description of what is included in  
15 those categories?

16 DR. EFFER: Miscellaneous area sources is  
17 a term that's used to describe non-point sources. And  
18 the others I think are miscellaneous point sources.

19 MS. PATTERSON: So give some examples of  
20 non-point sources that would produce VOCs? Does hydro  
21 come in either of these categories, or do utilities?

22 DR. EFFER: I believe the hydro source  
23 would be in the others. I'm not absolutely certain of  
24 that.

25 THE CHAIRMAN: I think I recall in your

1 evidence you said that the hydro was in the others.

2 DR. EFFER: Yes.

3 THE CHAIRMAN: Is there some doubt about  
4 that?

5 That was my recollection, anyway.

6 [10:53 a.m.]

7 DR. EFFER: Volatile organic compounds  
8 can come from a variety of sources, I mentioned in my  
9 direct evidence. One source is vegetation that  
10 provides a substantial amount of VOCs in the  
11 atmosphere. That can be termed a miscellaneous area  
12 source.

13 MS. PATTERSON: So these are not  
14 industries that are included in miscellaneous area  
15 sources?

16 DR. EFFER: In as far as that individual  
17 industries would have a point source, then they would  
18 not be put into that category.

19 Another man made source is furnaces, our  
20 domestic furnaces, which are, of course, area wide, and  
21 incomplete combustion, which is typical of these  
22 various natural gas and oil burning furnaces, and to  
23 some degree coal burning furnaces would produce  
24 volatile organic compounds. That probably, in an urban  
25 environment, would comprise the majority of those area



1 sources.

2 MS. PATTERSON: Thank you. And you spoke  
3 about the CAP program and Clean Air Program. Did you  
4 have any information on the date of implementation of  
5 that?

6 DR. EFFER: We have gone through the  
7 process of commenting on the Ministry's initial draft.  
8 We have worked very extensively with the government on  
9 modelling procedures on a technical basis but, to my  
10 knowledge, we have heard very little recently about the  
11 progress towards finalizing that amendment to  
12 Regulation 308.

13 MS. PATTERSON: Thank you.

14 THE CHAIRMAN: Mr. Watson, we can now  
15 turn to you.

16 MR. WATSON: Thank you, Mr. Chairman.

17 First of all, Mr. Chairman, I have a  
18 package of materials that I would like to have entered  
19 as the next exhibit, please.

20 THE REGISTRAR: That will be No. 479.

21 ---EXHIBIT NO. 479: Excerpts from various Hydro  
22 documents, interrogatories and  
other reports.

23 MR. WATSON: Mr. Chairman, you will  
24 recall from our earlier cross-examinations that this is  
25 excerpts from various Hydro documents, interrogatories,

1 other reports, and I have just compiled the appropriate  
2 pages to make it easier to follow the cross-  
3 examination. Certainly the witnesses are free to look  
4 at the complete documents in their answers.

5 Mr. Chairman, I am going to start with a  
6 review of the life extension issue, but just before I  
7 get into that, there are a couple of things I would  
8 like to take up with Mr. Meehan, just minor  
9 corrections.

10 CROSS-EXAMINATION BY MR. WATSON:

11 Q. Mr. Meehan, in your direct evidence,  
12 Volume 108, page 18912, starting at line 2, You are  
13 referring to Nanticoke, and you say it comprises four  
14 500 megawatt units. My understanding is Nanticoke is  
15 eight units, is that correct?

16 MR. MEEHAN: A. Thank you for drawing  
17 that to my attention. There are eight units at  
18 Nanticoke.

19 Q. Also, Mr. Meehan, a few pages along,  
20 at page 18915, down at line 22, the paragraph starts  
21 with you referring to oil fueled combustion turbine  
22 units. You say:

23 They have low capital costs and high  
24 fueling costs.

25 You then go on to say:

1                   Economically they are more suitable  
2                   for base load applications.

3                   Did you mean to say peaking?

4                   A. That's correct.

5                   MR. WATSON: Now, Mr. Chairman, as I  
6                   indicated, I would like to deal with plant life  
7                   extension. That would be the majority of my  
8                   cross-examination.

9                   Q. Now I imagine as a result most of my  
10                  questions will be for you, Mr. Meehan, or you, Mr.  
11                  Burpee. Certainly if any of the other panel members  
12                  want to add anything, certainly you are free to do so.

13                  First of all, what we are talking about  
14                  in plant life extension is 4,300 megawatts of fossil  
15                  being extended, their life being extended; is that  
16                  correct?

17                  MR. MEEHAN: A. In the period to 2014,  
18                  that is correct, yes.

19                  Q. Originally the service lives of all  
20                  of those units were 40 years when the DSP was put  
21                  forward.

22                  A. That's correct.

23                  Q. And also when Panel 2 testified?

24                  A. That is also correct.

25                  Q. This 4,300 megawatts, that's the

1 capacity of the Lambton units and the Nanticoke units  
2 that were planned to be retired in the DSP?

3 A. That's true.

4 Q. I assume, taking it one step further,  
5 if in fact the other four Nanticoke units are life  
6 extended, then we would not have just 4,300 megawatts,  
7 but we would have an extra 2,100 megawatts on top of  
8 that; is that fair?

9 A. Yes, that's true, if you have the  
10 numbers right on Nanticoke. There may be only three  
11 Nanticoke units included in the period to 2014. I'm  
12 not exactly sure of that. It is either three or four.

13 Q. If you have Exhibit 3 in front of  
14 you, Mr. Meehan, I think page 1412 refers to the  
15 retirements, and you will see the last four entries on  
16 figure 412 show four Nanticoke units.

17 A. I believe you are correct. In order  
18 to get 4,300 megawatts, you would need eight 500  
19 megawatts units.

20 Q. So as I am saying, if in fact the  
21 four other Nanticoke units were extended, that would  
22 give you another roughly 2,000 megawatts on top of  
23 that?

24 A. That's right.

25 Q. So we would be talking a total of

1       about 6,300 megawatts?

2                   A.   In the longer period, that's true.

3                   Q.   Now, panel, just to put this in  
4       context, in your evidence you described life extension  
5       as a key component of the update.  As you know, plant  
6       life extension was discussed in Panel 2, where Hydro  
7       was assuming a 40-year life span, and that no doubt you  
8       have reviewed that evidence, panel, and certainly the  
9       Board is familiar with that evidence, and there is no  
10      doubt that Hydro expressed some uncertainty and  
11      certainly doubt about plant life extension at that  
12      time.

13                  That is what I want to explore with you,  
14      Panel.  In particular, if you could turn to Volume 19,  
15      pages 3250 and 3251, what I would like to do is look at  
16      the uncertainty that was surrounding plant life  
17      extension, a mere --

18                  THE CHAIRMAN:  I'm sorry, what were the  
19      pages again?

20                  MR. WATSON:  That's Volume 19, pages 3250  
21      and 3251, Mr. Chairman.

22                  THE CHAIRMAN:  Thank you.

23                  MR. WATSON:  Just the last line on page  
24      3250 leading over to what I really want to look at,  
25      which is at page 3251.



1                   And, Mr. Chairman, you will recall that  
2           in Panel 2 there was, as I said, great discussion about  
3           the uncertainty with respect to plant life extension.  
4           I would like to explore that with this panel and find  
5           out in effect what has happened to the uncertainty.

6                   Q. Now, panel, starting at page 3250,  
7           the evidence of Panel 2 is as follows. I asked a  
8           question:

9                               "And how would life extension make  
10                              these figures change?"

11                   Just do put that in context, I had been  
12           discussing heat rates, and OM&A costs, other things  
13           with a view of comparing new plants and existing  
14           plants. And the panel answers:

15                              "Well, that's the whole question,  
16                              that you don't know. You cannot now...  
17           and I emphasize that word now,

18                              "...meaningfully project what those  
19                              will be. And as I gave in my direct  
20                              testimony, the prudent way to do this, if  
21                              you make a judgment now, you gamble. You  
22                              gamble everything on a forecast and  
23                              forecasts are not that reliable. So it's  
24                              not a prudent thing to do.

25                              "The prudent thing to do is to make



1                   this judgment..."

2       And by "that" I assume he's talking about the life  
3       extension judgment.

4                   "...at a future time when enough of  
5                   the world has evolved that you know what  
6                   its maintenance and other costs are, you  
7                   know what environmental regulations have  
8                   to be applied, you know what the prices  
9                   relevant to that fuel are at that future  
10                  date, and that could be different. At  
11                  that point You are able to make a  
12                  decision."

13               And finally the last paragraph in that  
14       answer:

15                "It is very risky to make a life  
16                extension decision now, because we have  
17                already, we believe, extended the life of  
18                these plants to the maximum prudent  
19                feasible limit."

20               When I read that, Mr. Meehan or Mr.  
21       Burpee, it seemed to me to be just completely at odds  
22       with what I heard in the update. Certainly the  
23       argument was being put forward very forcefully in Panel  
24       2 that a plant life extension decision cannot be made  
25       at this time.

1                   Now we are roughly talking about the same  
2                   time as far as lifetime decisions of units are  
3                   concerned, so I guess my simple question to you is are  
4                   you now saying you disagree with what is here, that you  
5                   can make a life extension decision at this time?

6                   MR. MEEHAN: A. Well, I think a number  
7                   of the things that are said there have, in fact,  
8                   happened. I believe that I went through a number of  
9                   those in my direct evidence yesterday. The planning  
10                  environment has changed, so the risk that we are taking  
11                  with respect to this decision is considerably less than  
12                  it was at that time.

13                  At that time new generation was required  
14                  in 2002, and we didn't have the time that we have now  
15                  to make certain that the decision we are taking now is  
16                  the correct one.

17                  MR. SHALABY: A. To put this in some  
18                  context as we, the Update is calling for Nanticoke and  
19                  Lambton at this time for life extension. Let's not  
20                  forget that the Update is also calling for Lakeview and  
21                  Pickering to retire at 40 years.

22                  So I think there hasn't been a wholesale  
23                  move from one age to another. Half the plants that we  
24                  thought would retire are continuing to be retired, and  
25                  the other half we think we can explore the option of

1 life extension, just to put that in context.

2 Q. I'm sorry, Mr. Shalaby, just so I  
3 understand what you were saying, you are saying that  
4 the Update is still calling for Lakeview to be retired.

5 A. Yes, at this stage, for  
6 representative or illustrative examples using the  
7 Update, they assumed Lambton and Nanticoke subject to  
8 further exploration of the stages, yes.

9 Q. So, Mr. Meehan, just so I understand  
10 your evidence, you are saying the planning environment  
11 has changed between May, when this evidence was given  
12 on Panel 2, and today, and as a result of that, it is  
13 no longer risky to make the life extension decision, it  
14 is no longer imprudent to make that decision, and it is  
15 not a gamble now?

16 MR. MEEHAN: A. It is not as risky and  
17 it is not as imprudent and it is not as big a gamble  
18 now.

19 Q. So your evidence is all of those  
20 factors still apply, but to a lesser extent?

21 A. Considerably lesser extent, yes.

22 Q. Now you say the planning environment  
23 has changed. You are referring to the change between  
24 planning to the upper and planning to the medium; is  
25 that right?

1                   A. No, I'm referring more to the amount  
2 of non-utility generation that we are going to acquire,  
3 to the additional demand management that was indicated  
4 following the testimony of Panel 2, the load forecast  
5 is also different.

6                   It's true that the Moose River, the  
7 exclusion of the Moose River sites argue in the other  
8 direction, but these others three major changes to the  
9 planning permitted us this time to deal with this topic  
10 in this way.

11                  Q. Looking at that last paragraph, Mr.  
12 Meehan, there is another component to it as well. We  
13 are not only talking about the risk in making the  
14 decision, but one of the reasons they are saying that  
15 it is risky is that they have already extended the life  
16 of the plants to the maximum prudent feasible limit.

17                  Now, I would like to take some time and  
18 look at how these decisions are made. Decisions with  
19 respect to life extension are made by the Depreciation  
20 Review Committee, is that correct?

21                  A. Certainly with respect to rate  
22 setting purposes; not necessarily for planning  
23 purposes.

24                  Q. Who makes a decision with respect to  
25 these life extensions for planning purposes?

1                   A. The planning part of the organization  
2     does that.

3                   Q. System planning?

4                   A. Power System Planning Division, yes,  
5     would.

6                   Q. And they receive inputs from various  
7     organizations or various divisions, such as the  
8     Depreciation Review Committee?

9                   A. They would likely be involved in a  
10    decision like that.

11                  Q. I assume they would be very  
12    interested in what that committee said?

13                  A. Yes.

14                  Q. Just to put it in perspective, I  
15    would assume that that committee would provide some  
16    very valuable information. Is there any other  
17    information that would be more significant than what  
18    that committee would put forward?

19                  A. That committee is comprised of  
20    various parts of the organization, as I believe you  
21    know. So that all of the members on that committee  
22    would in fact be interested in a decision of this kind.  
23    As you are also probably aware, in the figure that we  
24    were referring to earlier when Dr. Connell was asking  
25    the questions that showed the different retirement, the



1 three different retirement amounts of generation, the  
2 Depreciation Review Committee, in 1984 - I believe it  
3 was for the 1985 rates, but I could be a year out in  
4 what I have just said - the Depreciation Review  
5 Committee recommended extending the lives of fossil  
6 stations to 40 years from either 30 or 35 years.  
7 Lambton and Nanticoke had been extended to 35 years  
8 prior to that.

9 It was not accepted by the Ontario Energy  
10 Board in that year, and it did not result in a change  
11 with respect to the Ontario Energy Board or the rate  
12 setting or the depreciation review committee until  
13 1989. So it wasn't until, in fact, the year of the  
14 Demand/Supply Plan that that part of the organization  
15 accepted - nor did the Ontario Energy Board, I think,  
16 accept until 1989 - a 40-year life.

17 I think this contributes to the testimony  
18 of Panel 2, when they had just, just received all, more  
19 or less all parts of the corporation's agreement to  
20 extend that to 40 years, that Panel 2 took the line  
21 that it did with respect to not wanting to be too  
22 flexible in extending it beyond 40 years.

23 Q. Well, I'm going to go through the  
24 various years, Mr. Meehan. Isn't it fair to say,  
25 though, that Panel 2 had that information substantially



1 before they testified?

2 A. Which information?

3 Q. The one you were just referring to.

4 A. I don't know which information you  
5 mean.

6 Q. You were talking about changing the  
7 service lives to 40 years. Isn't the reality - and you  
8 were talking about how all the organizations in Hydro  
9 finally had the same information - they had that  
10 information well before they testified.

11 [11:15 a.m.]

12 A. Yes, to the 40-year life they did.

13 Q. Now, Mr. Meehan, I have put  
14 Interrogatory 2.7.50 in my package, that's at page 1.

15 Mr. Register, could we have a number for  
16 that, please?

17 THE REGISTRAR: 475.3.

18 ---EXHIBIT NO. 475.3: Interrogatory No. 2.7.50.

19 MR. WATSON: Mr. Chairman, starting at  
20 page 1, you will see that this is an extensive  
21 interrogatory. It included five parts to it. The  
22 first four I will not deal with. Those are reports  
23 dealing with CTUs, Hearn, Keith, Lennox and Big Chute.  
24 The fifth part is extracts from the Depreciation Review  
25 Committee since 1980. What I have done is taken

1 extracts from those extracts.

2 They are in chronological order going  
3 backwards from 1990. If we could turn to the first one  
4 which is on page 14 of my material. That is a  
5 recommendation of the 1980 Committee to be effective  
6 January 1st, 1981.

7 Q. And Mr. Meehan, as you were saying,  
8 the recommendation at that time was 30 years?

9 MR. MEEHAN: A. Forty years, yes.

10 I'm sorry, are you looking at --

11 Q. I am on page 14, Mr. Meehan, which is  
12 the 1980 report, to be effective January 1st, 1981. I  
13 was going to go through this chronologically. So the  
14 recommendation in 1980 for 1981 was 30 years?

15 A. Yes, that's correct.

16 Q. I also note in looking near the  
17 bottom underneath the words "It is recommended that  
18 effective January 1st, '81," that bullet, if you refer  
19 to the last three lines, it says the generating units  
20 within a station be segregated and their respective  
21 remaining lives be reviewed.

22 Mr. Meehan, I suggest to you that that is  
23 indicating that plant life extension decisions are very  
24 site-specific decisions; is that fair?

25 A. Yes, that's fair.

1 Q. They are not decisions that are made  
2 on a broad system basis.

3 A. That may be generally true.

4 Q. That is because these plant life  
5 extension decisions are based on economic feasibility,  
6 technical feasibility, environmental feasibility which  
7 is a function of what is happening at a particular  
8 unit?

9 A. At a particular station generally,  
10 yes.

11 Q. In fact, even the amount of space at  
12 a station is important with respect to life extending;  
13 isn't that fair?

14 A. Space is one of the things we  
15 consider, yes.

16 Q. Now, in going through these  
17 recommendations, we see that the recommendation remains  
18 the same for 1982, and that's at page 13. Also, for  
19 1983 it still is at 30 years, and that's at page 12,  
20 for 1984 it is still 30 years, and that is at page 11,  
21 and at page 10, the 1984 report for 1985 still has it  
22 at 30 years.

23 . You have no difficulty with that, Mr.  
24 Meehan?

25 A. That is correct.

1 Q. In 1985 the Committee recommended  
2 that the life be extended to 40 years, and that is at  
3 page 9 of the material.

4 A. That is right.

5 Q. If I could digress for just one  
6 minute, please. Mr. Burpee, this may be more a  
7 question for you.

8 You will notice in looking at the reasons  
9 for extending it, Hydro refers to start/stop cycles  
10 which is referred to basically as cycling. Now, down  
11 near the bottom of the page, the second last sentence  
12 the Committee refers to more recent experience  
13 indicating that physical stresses on a continuous  
14 operation are of the same significance in limiting the  
15 service life of a fossil generating station as a  
16 physical stress of frequent start/stop operating  
17 patterns.

18 Is that still Hydro's position on  
19 cycling.

20 MR. BURPEE: A. Yes, there is some  
21 effect of cycling, and a number of turbine  
22 manufacturers will actually give you an equivalent  
23 number of operating hours to a start/stop cycle,  
24 whether it's a hot, warm or cold start.

25 Q. Well, you are saying that there is

1 some effect due to cycling. Now this seems to indicate  
2 that their really isn't a problem with cycling.

3 To be fair to you, Mr. Burpee, the reason  
4 I am asking the question is I have heard and I have  
5 read competing ideas about the effect of cycling. My  
6 simple question is: What is Hydro's latest position on  
7 cycling?

8 A. We believe there is some impact but  
9 no one has been able to quantify it.

10 Q. Okay. Do you have any studies on it?

11 A. There are no studies that I am aware  
12 of.

13 Q. Is someone looking at it right now?

14 A. I would think the only thing we are  
15 looking at now is before we two-shift a unit, which  
16 impacts the start/stop number of cycles, within the  
17 system control centre they have a criteria to meet  
18 before we do it that has a certain dollar value.

19 THE CHAIRMAN: I am sorry, has a certain  
20 what?

21 MR. BURPEE: Dollar value. In other  
22 words, there has been has to be a benefit to the  
23 corporation of so many dollars before we will do a  
24 two-shift, and the cost difference we look at is the  
25 cost as of running at minimum load overnight and



1       deferring some other form of generation.

2                   MR. WATSON: Q. So, Mr. Burpee, your  
3       evidence is that there is some effect of cycling but  
4       it's unknown right now and your people are trying to  
5       determine what it is and hopefully some day you will  
6       know what it is?

7                   MR. BURPEE. A. I think ourselves and a  
8       number of other utilities have been trying to determine  
9       it for a number of years.

10                  Q. Mr. Burpee, I am looking at  
11       recommendation of the Committee on page 9, and if you  
12       look at the recommendation there is a bullet and then  
13       there is a paragraph that starts with the words  
14       "Ontario Hydro's". If you go down that paragraph, the  
15       second last sentence, seven lines up starts with the  
16       word "However", it basically refers to three factors:  
17       cycling, developments toward more stringent emission  
18       regulations, and the rising cost of fuel.

19                  The report then goes on to deal with each  
20       one of those. Paragraph A deals with cycling.

21                  The conclusion at paragraph A was that  
22       there was no real difference. They are of the same  
23       significance, cycling and running flat out.

24                  It seems to me that if, in fact, cycling  
25       now is an issue, then the argument that the DRC was



1 using at that time is no longer applicable; isn't that  
2 fair?

3 A. Just a second, I have to read what  
4 they have here.

5 I think we have to make a distinction  
6 between the impact on the life or cost. I think what  
7 we referred to, the impact of start/stop cycles, might  
8 have an impact on the cost or type of maintenance  
9 required.

10 It's hard just to compare base load  
11 operation maintenance versus start/stop maintenance.  
12 In other words, we produce less energy but there might  
13 be similar stresses or similar degradation that still  
14 require maintenance. So the ratio at which you go from  
15 base load to lower load generation is not -- as it  
16 drops the dollars don't drop one for one; it might be  
17 offset by the impact of increased starts.

18 So, what I am talking about, I am not  
19 talking about the impact on the life of a station; it  
20 might be on impact on the life of the component within  
21 it, such as a motor which with more starts impacts on  
22 the life. You might rewind it sooner than you would if  
23 it was base loaded. I would look at it as a cost, not  
24 as a life issue.

25 Q. Well, it's clear that this Committee

1 looked on it as a life issue, and that's one of the  
2 three reasons they gave for extending the life because  
3 in fact cycling wasn't a problem anymore. If you look  
4 down under paragraph A, about halfway down that  
5 paragraph there is a sense it starts of sentence that  
6 starts with the words "in the past", and that goes on  
7 to stay it was considered that stop/start operating  
8 patterns placed a greater stress on fossil generating  
9 stations than on base load production, indicating a  
10 shorter life expectancy for Ontario Hydro stations than  
11 those operating in the U.S.

12 Mr. Burpee, if your evidence is that  
13 cycling has an effect, and the Committee's concern was  
14 that cycling was a reason in the past for having  
15 shorter lives, then it seems to me that that reason is  
16 no longer there.

17 A. My evidence is that it is a  
18 manageable problem that does not impact on service life  
19 of the station.

20 Q. But you have no studies to that  
21 effect?

22 A. Not that I personally am aware of.

23 MR. WATSON: Okay. Perhaps I could have  
24 an undertaking, Mr. Chairman, and if they are some  
25 studies that show that cycling is not a problem with

respect to life extension, I would like to have those  
produced.

THE REGISTRAR: 478.4.

---UNDERTAKING NO. 478.4: Ontario Hydro undertakes to  
provide any studies that show  
cycling is not a problem with respect to  
life extension.

MR. WATSON: Q. Continuing on to the  
1986 report, the recommendation for 1987, was that the  
extension to 40 years be deferred to a later time based  
on the ongoing demand/supply option study.

Mr. Meehan, you were referring to the  
OEB, and if you turnover the page, page 8, you will see  
that at the second paragraph Ontario Hydro had made a  
commitment to the Ontario Energy Board to defer  
implementing the service life extension due to rate  
setting and accounting purposes. I assume that is what  
you were referring to.

MR. MEEHAN: A. For rate setting and  
accounting purposes, that's right. It says that in the  
first large paragraph and it repeats it in the next  
paragraph down.

The planning at that time was being based  
on the longer lifetime, and I think that's why those  
phrases are in there.

Q. But you certainly weren't going to

1 implement it at that time because you had made a  
2 commitment to the OEB.

3 A. We are not going to implement it for  
4 rate setting purposes, but we were doing our planning  
5 on that basis.

6 Q. Following along, Mr. Meehan, to page  
7 5, there is a 1987 report which, for the reasons you  
8 have just mentioned indicated that the life expectancy  
9 would be retained in the 30 to 35 year range.

10 If you turn the page, Mr. Meehan, to page  
11 6, the third paragraph on that page, the one starting  
12 with the words "Ontario Hydro's", that paragraph is  
13 talking about the Lakeview station and extending that  
14 beyond its retirement date of 1996, and it refers to a  
15 Lakeview inspection program. It says it's under way to  
16 determine the physical condition of the station and the  
17 rehabilitation requirements to extend the remaining  
18 service of the station beyond its current remaining  
19 service life. The Committee will make a recommendation  
20 on the extension of the remaining service life of  
21 Lakeview after the results of the inspection and  
22 subsequent economic assessment of Lakeview becomes  
23 available.

24 I would just like you to remember that,  
25 Mr. Meehan, and Members of the Board, because I will be

1 referring to that later in another context.

2 A. The 1996 date that is referred to  
3 there is the end of Lakeview's 30-year assumed  
4 lifetime.

5 Q. That is correct, Mr. Meehan. As I  
6 pointed out to you when we started figure 14-12 it  
7 shows the 40 years lives for the stations with  
8 Lakeview's retirement starting in the year 2002.

9 A. Yes. With an average of 2006, which  
10 would be a 40-year life.

11 Q. Yes. And then proceeding on, Mr.  
12 Meehan, on page 4, the Depreciation Review Committee  
13 Report for 1988, which would be effective in '89  
14 recommends extension to 40 years. There are a couple  
15 of points I would like to note on that.

16 First of all, the third paragraph says  
17 that the Depreciation Review Committee has assessed the  
18 key determinants of service life for fossil generating  
19 stations, and it has concluded that Ontario Hydro's  
20 fossil generating stations are expected to be required  
21 and be able to meet Ontario's energy needs during a  
22 40-year service life.

23 It then goes on to the next paragraph  
24 and that's the one I would like to spend sometime on.

25 Key considerations for the extension of



1 the service lives of fossil generating stations  
2 include: And the first factor is, forecast demand for  
3 generation; second factor is contents of the draft  
4 demand/supply planning strategy with respect to  
5 existing fossil generation; the third one is the  
6 economics of rehabilitation in view of the preliminary  
7 results of the Lakeview inspection program; the fourth  
8 factor is acid gas management, and the fifth factor is  
9 the location and expected mode of operation of existing  
10 fossil generation stations.

11 THE CHAIRMAN: I take it you are going to  
12 go to through one of these in turn?

13 MR. WATSON: I am going to go through  
14 each one.

15 THE CHAIRMAN: Perhaps we should take the  
16 break and then we can deal with them one at a time.

17 MR. WATSON: Sure.

18 THE CHAIRMAN: We will adjourn for 15  
19 minutes.

20 THE REGISTRAR: The hearing will take a  
21 15-minute recess.

22 ---Recess at 11:30 a.m.

23 ---On resuming at 11:46 a.m.

24 THE REGISTRAR: This hearing is again in  
25 session. Please be seated.



1 MR. WATSON: Thank you, Mr. Chairman.

2 Q. You will recall that we were looking  
3 at the 1988 Committee report on page 4 of Exhibit 479.  
4 That recommends a life extension to 40 years, and we  
5 saw that the Committee had looked at the key  
6 determinants and before the break we had started to  
7 review the five that are mentioned in the fourth  
8 paragraph.

9 Mr. Meehan, the first one is forecast  
10 demand for generation. In looking at the retirements  
11 in figure 4-12, we see the first Lambton retirement is  
12 in 2010. Is that fair?

13 MR. MEEHAN: A. In the order of that. I  
14 thought it was 2008. I would have to get that.

15 MR. SHALABY: A. There is one in 2009,  
16 but that is not the first one in the list, it is the  
17 second one on the list.

18 Q. You are right, Mr. Shalaby, you are  
19 retiring Unit 2 before Unit 1 in 2009. That's the  
20 first Lambton retirement. The rest are in 2010, and  
21 then the first Nanticoke retirement is in 2013. There  
22 are three in 2013, and one in 2014. Does that accord  
23 with your understanding?

24 MR. MEEHAN: A. Yes, that's my  
25 understanding.

1 THE CHAIRMAN: I'm sorry, what table are  
2 we looking at, the DSP?

3 MR. WATSON: I was looking at the DSP,  
4 Mr. Chairman. That's figure 14-12 on the....

5 THE CHAIRMAN: 14-12, I had 14-02.

6 MR. WATSON: On page 14-12.

7 MR. HOWARD: It's 4-12.

8 MR. WATSON: Oh, sorry, 4-12. I'm sorry,  
9 Mr. Chairman, it's 4-12, the existing system chapter.

10 THE CHAIRMAN: All right, go ahead.

11 MR. WATSON: Q. So, Mr. Meehan, dealing  
12 with that first point, forecast demand for generation,  
13 any uncertainty associated with the demand for  
14 generation is going to be translated into this decision  
15 with respect to life extension, isn't that fair?

16 MR. MEEHAN: A. Any uncertainty with  
17 respect to the demand?

18 Q. Yes.

19 A. That would be one of the things that  
20 would be considered, yes.

21 Q. It would certainly be considered.  
22 But any uncertainty with respect to the load forecast  
23 is going to be translated into this, into this decision  
24 with respect to life extension?

25 A. Yes.

1 Q. And the retirements that we are  
2 referring to here, Lambton and Nanticoke, are at the  
3 very end of the planning horizon, isn't that fair?

4 A. That's fair.

5 Q. And the uncertainty is greater at  
6 that time, correct?

7 A. Yes.

8 Q. The second point is the contents of  
9 the draft demand/supply planning strategy with respect  
10 to existing fossil generation. Now, when this  
11 recommendation was made, and when Panel 2 testified and  
12 today, there has been no change in that. That's still  
13 the same; isn't that correct?

14 A. I believe that is correct. I think  
15 what that is referring to is that we should make the  
16 best use of our existing facilities. That hasn't  
17 changed.

18 Q. That was the philosophy when Panel 2  
19 was testifying as well.

20 A. That's true.

21 Q. So there's been no change in that  
22 philosophy.

23 A. No, the philosophy hasn't changed.

24 Q. The third point is the economics of  
25 rehabilitation in view of the preliminary results of

1 the Lakeview TGS inspection program.

2 Now, I would like to take a few minutes  
3 and look at the Lakeview program. If you would turn  
4 with me to page 15 of Exhibit 479, Mr. Meehan, you will  
5 see that originally Hydro proposed to rehabilitate all  
6 eight units at Lakeview at a cost of one billion one  
7 hundred thirty-nine million dollars, is that fair?

8 A. That's true.

9 Q. And then subsequently that original  
10 estimate to rehabilitate all eight units was increased  
11 to one billion five hundred twenty million dollars?

12 A. Yes.

13 Q. And both those estimates are to bring  
14 the units up to a high level of reliability, is that  
15 fair?

16 A. That's correct.

17 Q. Now as I understand it, only four  
18 units are currently being rehabilitated. That's units  
19 1, 2, 5 and 6, is that fair?

20 A. That's the decision that's been taken  
21 so far.

22 Q. The cost for those four units is only  
23 \$850 million?

24 A. Yes. I'm glad you said only.

25 Q. I'm going to get to that, Mr. Meehan.

1                   Units 5 and 6 are being rehabilitated to  
2                   the original work scope. That's full rehabilitation  
3                   for full reliability, is that fair?

4                   A. Yes, and I believe they are in  
5                   service now.

6                   Q. And units 1 and 2 are getting lesser  
7                   rehabilitation; correct?

8                   A. Yes.

9                   Q. And those two are getting lesser  
10                  rehabilitation with respect to areas primarily relating  
11                  to reliability?

12                  A. That's correct.

13                  Q. Now if I look at those figures, Mr.  
14                  Meehan, just a rough estimate, I note that \$850 million  
15                  is more than half of the final estimate of one billion  
16                  five hundred twenty million dollars. So it would seem  
17                  to me if you are only doing half of the units, you  
18                  should be able to do the complete rehabilitation job,  
19                  including the reliability component.

20                  A. Well, I don't think you can draw that  
21                  conclusion without knowing what the cost might be to  
22                  set up the construction force on site and that kind of  
23                  thing and the inspections.

24                  Q. Well, Mr. Meehan, Lakeview, as I  
25                  understand it, is composed of four sets of two units,

1 two identical units, correct?

2 A. Yes, and common services.

3 Q. Yes. And Units 1 and 2 are similar,  
4 and Units 5 and 6 are similar.

5 A. Yes.

6 Q. Now, is it your evidence that if \$850  
7 million is needed to do the four units that they're  
8 looking at, that the balance, the difference between  
9 the one billion five hundred twenty million and the 850  
10 million is what is necessary to do the remaining four  
11 units?

12 A. At the time those estimates were  
13 made, the difference would be the amount of money that  
14 would have repaired the four later units to the high  
15 level of reliability and would have completed the units  
16 1 and 2 to that high level of reliability, the  
17 difference would have been.

18 MR. BURPEE: A. If I can add to clarify  
19 here for you, you can't omit the amount of common  
20 services, the water treatment plant, the coal yard work  
21 that has been done, which is common to all eight units.  
22 Service air and instrument air systems have also been  
23 worked on. As Mr. Meehan mentioned, there were the  
24 site set-up costs, and 850 also means the costs for  
25 closing up the site in terms of the construction



1 activities and removing all the buildings and putting  
2 the site back to the condition it was before the work  
3 started.

4 There is another factor here in doing the  
5 work. The costs of 5 and 6 are higher than the other  
6 units, but there is also, what we say, apply a learning  
7 curve, that by changing construction techniques and the  
8 way we do the work, that future work of a similar  
9 nature doesn't cost as much.

10 Q. You anticipate it won't cost as much.  
11 Isn't it fair to say that one of the reasons that the  
12 reliability work isn't being done is because you have  
13 in effect had another cost increase? It originally  
14 started at one billion one hundred thirty-nine million,  
15 it went up to one billion five hundred and twenty  
16 million.

17 Isn't the reality that to do what you  
18 originally expected to do, rehab all eight units to  
19 full reliability, is now going to cost more than one  
20 billion five hundred and twenty million?

21 MR. MEEHAN: A. No, I have not heard  
22 that at all. I have never heard that.

23 Q. So Hydro's position is today that the  
24 one billion five hundred and twenty million is  
25 sufficient to bring all eight units up to full

1 reliability?

2 A. If we elected to do that. But we are  
3 studying what to do with the remaining four units. And  
4 it's very likely that we won't undertake that work.

5 Q. What is your estimate --

6 THE CHAIRMAN: Likely that you won't?

7 MR. MEEHAN: Won't.

8 MR. WATSON: Q. What is your estimate of  
9 what it would cost to bring all four units, that's 1,  
10 2, 5 and 6, up to full reliability? How much more than  
11 850 million would that cost?

12 MR. MEEHAN: A. I don't have that  
13 information.

14 Q. Can you provide it, please?

15 A. Yes, I believe it's available.

16 Q. Thank you.

17 THE CHAIRMAN: That will be 478.5, is  
18 that right, Mr. Registrar.

19 THE REGISTRAR: 478.5, yes.

20 ---UNDERTAKING NO. 478.5: Ontario Hydro undertakes to  
21 provide the estimate of what it would  
22 cost to bring units 1, 2, 5 and 6 up to  
23 full reliability, and whether the figure  
of one billion five hundred and twenty  
million dollars for the second set of  
four units has changed.

24 MR. WATSON: Q. Just so that I have it  
25 clear, Mr. Meehan, the total of the 850 million, plus

1 the figure you are about to give me, will be what is  
2 required to bring those four units up to full  
3 reliability.

4 Now the difference between that figure,  
5 that final figure, whatever it is, and the one billion  
6 five hundred and twenty million is what would be  
7 required to bring the final four units up to full  
8 reliability?

9 MR. MEEHAN: A. Yes, I believe that's  
10 correct, unless the 1,520 has in fact changed, and I'm  
11 unaware of it.

12 We have had no reason in the last year to  
13 re-examine that estimate of 1,520.

14 Q. Well, can we add to that last  
15 undertaking, Mr. Meehan, that if in fact that has  
16 changed, you will let me know? Why don't we put it  
17 this way? You will include in that undertaking whether  
18 1,520 is still a valid figure.

19 MR. HOWARD: Excuse me, that is very  
20 different from the answer that Mr. Meehan said, gave.  
21 He said it hasn't been re-examined in the last year,  
22 and we certainly are not going to re-examine that.  
23 What he has said is that he believes we have how much  
24 was saved by the work left out of 1 and 2. But the  
25 next question involves, I believe, a very extensive

1 review that just hasn't taken place.

2 THE CHAIRMAN: Well, all Mr. Watson is  
3 asking, if such review does take place, that the  
4 results of that review will be made known to him.

5 MR. HOWARD: I didn't understand it  
6 correctly. Yes, that we will do.

7 MR. WATSON: Q. The four Lakeview units  
8 that are not being rehabed, that's units 3, 4, 7 and 8;  
9 is it fair to say they are in worse condition than the  
10 four that are being rehabilitated? Isn't that the  
11 reason they are not being rehabilitated?

12 MR. MEEHAN: A. Maybe Mr. Burpee can  
13 answer that.

14 MR. BURPEE: A. I'm not sure if I  
15 understand. Could you say that again?

16 Q. You are rehabilitating four units?

17 A. That's correct.

18 Q. And not rehabilitating the other  
19 four?

20 A. Yes.

21 Q. My question is are the four that you  
22 are not rehabilitating worse than the four that you  
23 are?

24 A. Before or after the rehab?

25 Q. I am hoping I know the answer to the

1 after. I was more interested in the before.

2 A. In before? 1 and 2 had the worst  
3 reliability before rehab of the four pairs. I don't  
4 recall where 5 and 6 was relative to 3 and 4 and 7 and  
5 8. I can tell you in the past year, 1991, 3 and 4 had  
6 the best performance in terms of DAUFOP. But it is  
7 generally acknowledged that 3 and 4 are likely in worse  
8 condition than 7 and 8, but they did have a good year  
9 in 1991.

10 MS. PATTERSON: So that was 1 and 2 were  
11 better than...

12 MR. BURPEE: No, 1 and 2 have  
13 predominantly been the worst performers in terms of  
14 reliability for the last, oh, at least three, four  
15 years, due to the condition of the precipitators more  
16 than anything else, which have been replaced.

17 MR. WATSON: Q. Mr. Burpee, just to make  
18 sure I understand, my question was specifically with  
19 respect to the condition of the units, and your answer  
20 was with respect to their performance, and as we know,  
21 are a number of things that can affect the performance  
22 of a unit.

23 For instance, I believe in 1989 or 1990  
24 you didn't run some of your units, because you wanted  
25 to buy electricity from the United States to keep

1 within your acid gas regulations.

2 My question is with respect to the  
3 condition of the units. What is the condition of the  
4 four units you are not rehabilitating with respect to  
5 the four that you are? And the time frame is when you  
6 started the rehab.

7 MR. BURPEE: A. When we started 1 and 2  
8 were the worst, then 3 and 4, then 5 and 6 and then 7  
9 and 8.

10 Q. This interrogatory indicates, Mr.  
11 Burpee, that as a result of the reduced capital  
12 expenditure, and that's with respect to the  
13 reliability, I assume, there will be higher annual  
14 operating maintenance and capital modification costs  
15 expected. Is that still true?

16 A. Yes, it is.

17 THE CHAIRMAN: This interrogatory refers  
18 to 8.9.45?

19 MR. WATSON: That is correct, Mr.  
20 Chairman.

21 THE CHAIRMAN: And should be marked?

22 MR. WATSON: Yes.

23 THE REGISTRAR: That will be Exhibit 5.4.

24 ---EXHIBIT NO. 475.4: Interrogatory No. 8.9.45.

25 MR. WATSON: Q. Now, Mr. Burpee, as I



1 understand it, Hydro did an extensive inspection of  
2 Lakeview in 1986 and 1987; is that fair?

3 MR. BURPEE: A. That's correct.

4 Q. And produced condition assessment  
5 reports in 1987 and 1988.

6 A. That's correct.

7 Q. As I understand it, Lakeview was  
8 found to be in far worse condition than it was first  
9 thought.

10 A. I'm not sure where that judgment  
11 comes from.

12 Q. Comes from page 16 of my material.

13 A. I've read it, but I don't know who  
14 actually made that judgment, because I'm not sure what  
15 anyone expected to find when we did them.

16 MR. HOWARD: Perhaps we could be told  
17 what page 4 is.

18 MR. WATSON: Page 16 of Exhibit 479 is  
19 from the Lakeview rehabilitation report, and the  
20 paragraph I was referring to with Mr. Burpee was  
21 paragraph No. 1 entitled "Background."

22 Q. This document is no surprise to you,  
23 Mr. Burpee, you are familiar with it?

24 MR. MEEHAN: A. It's no surprise to me.

25 Q. Mr. Meehan?

1 A. Yes.

2 Q. This is a Hydro document?

3 A. Yes.

4 Q. And it indicates what I was just  
5 referring to with you, Mr. Burpee, and it specifically  
6 states:

7 "The station was found to be in far  
8 worse condition than first thought."

9 A. I think that refers to part of the  
10 process we go through when we assess and rationalize  
11 proceeding with a project. That process concerns the  
12 business planning process and the capital construction  
13 program process.

14 Several years prior to a project getting  
15 under way it is put into this process, and the  
16 reference here is made with respect to earlier  
17 estimates of the rehabilitation work that would be  
18 required. Those earlier estimates were considerably  
19 lower than the 1.1 billion dollars. I think that is  
20 the reference that is being made here.

21 Q. This condition assessment report was  
22 quite detailed. The interrogatory on page 17 indicates  
23 that it was 94 volumes.

24 MR. HOWARD: Mr. Chairman, just before we  
25 go on, obviously Mr. Meehan knows what page 16,

1 obviously my friend knows, but I don't think the Board  
2 knows and I certainly don't.

3 THE CHAIRMAN: I don't have any trouble  
4 knowing. It's Mr. Watson's compendium, which is  
5 Exhibit 479. Is that not right?

6 MR. WATSON: That's correct. And Mr.  
7 Howard, it's a Lakeview rehabilitation report. Mr.  
8 Meehan already told you that.

9 MR. HOWARD: Excuse me, but it's one page  
10 from some document which I haven't heard described yet.

11 MR. WATSON: Mr. Chairman, it's the  
12 Lakeview rehabilitation report. I'm sure Mr. Meehan  
13 and Mr. Burpee have looked at it ad nauseam. I don't  
14 think it is any surprise to them. It's a huge  
15 document. I am sure if Mr. Howard wants, Mr. Meehan  
16 and Mr. Burpee could bring it into the room, and there  
17 is a similar report for Lakeview.

18 Q. Isn't that correct, Mr. Burpee, Mr.  
19 Meehan?

20 MR. MEEHAN: A. Yes, there is. I'm not  
21 sure that the title of it is the Lakeview  
22 rehabilitation report. It escapes me right now what it  
23 is, but it is the report that was done that tells the  
24 story as to why we should proceed with the Lakeview  
25 rehabilitation. If I remember, the document might be

1       20 pages or 25 pages.

2                   MR. HOWARD: Having made the observation,  
3       I will find the document. Obviously we have got one  
4       page from it, and the one sentence that my friend has  
5       referred to refers to details in section 4. If the  
6       witnesses are comfortable answering questions about it,  
7       then I'll read it overnight.

8                   THE CHAIRMAN: I take it that this  
9       Exhibit 479 has been available to the witnesses, is  
10      that correct?

11                  MR. WATSON: That's correct, Mr.  
12      Chairman.

13                  MR. HOWARD: Since yesterday afternoon.

14                  THE CHAIRMAN: Just a moment, Mr. Howard.  
15      And that these documents that are referred to are  
16      attached to interrogatories, they are Hydro documents;  
17      is that right?

18                  MR. WATSON: These are all Hydro  
19      documents, Mr. Chairman.

20                  MR. HOWARD: Mr. Chairman --

21                  THE CHAIRMAN: Just a minute, Mr. Howard.  
22      Mr. Howard, just a moment.

23                  And I think you said at the beginning  
24      that they were free to look at any part of the document  
25      they wanted to. This is just for convenience of the

1 hearing, to put one of these compendiums in, that's why  
2 people have been doing it.

3 MR. HOWARD: Mr. Chairman, it's my  
4 understanding that this document is not attached to any  
5 interrogatory. When my friend answered you, he said  
6 it's a Hydro document. If it's attached to an  
7 interrogatory, I would like to know which one.

8 [12:07 p.m.]

9 MR. WATSON: Q. Mr. Meehan, Mr. Burpee,  
10 is this attached to an interrogatory?

11 MR. MEEHAN: A. Not that I am aware of.

12 Q. Your counsel clearly wants to see  
13 this document. Can you produce it for him at lunch?

14 A. Yes, I believe so.

15 Q. I think I understand Mr. Howard's  
16 concerns, Mr. Meehan and Mr. Burpee, am I taking  
17 anything out of context when I just referred to the  
18 background on paragraph one there? The investigations  
19 were conducted in 1986 and 1987, there is no dispute  
20 about that, is there?

21 A. No.

22 Q. The reports were prepared in '87 and  
23 '88; is that fair?

24 A. Yes.

25 Q. And the condition of the station was

1 worse than you thought it was going to be?

2 MR. BURPEE: A. Worse than the author  
3 thought it was going to be.

4 Q. Is there any document in Hydro  
5 correcting this that you are aware of?

6 A. No.

7 Q. Sorry?

8 A. No.

9 MR. WATSON: Mr. Chairman, I was  
10 referring to page 17 of Exhibit 479, that's  
11 Interrogatory 8.9.51.

12 THE REGISTRAR: That will be 475.5

13 THE CHAIRMAN: Thank you.

14 ---EXHIBIT NO. 475.5: Interrogatory No. 8.9.51.

15 MR. WATSON: Q. And that refers to the  
16 1987 and '88 Lakeview condition assessment reports and  
17 the answer indicates that these reports are very  
18 detailed and they are in '94 volumes and would not be  
19 produced.

20 My suggestion is that you start out, you  
21 had a '94 volume report, you produced an initial  
22 estimate of \$1,139,000,000 and that despite the  
23 extensive detail and the extensive work that you had  
24 done, that estimate increased by about a third from  
25 1,139,000,000 to one-billion five hundred and



1 twenty-nine. How did that happen, Mr. Burpee?

2 MR. BURPEE: A number of the jobs in  
3 there had not been done before by us. In fact, hadn't  
4 been done before by anyone probably.

5 The asbestos removal turned out to be far  
6 more lengthy and more expensive than had been  
7 estimated, that was boiler asbestos removal. The  
8 installation or replacement of the new control system  
9 also turned out to be far more lengthy and expensive  
10 than had been originally estimated.

11 Early in the project, the project  
12 originally was scheduled driven, they tried to do it  
13 all in nine months. As the schedule began to lag they  
14 put in more people and worked more overtime but they  
15 didn't get any benefit from it, so that forced the  
16 costs up as well.

17 I am trying to think, there were a number  
18 of other jobs that actually took longer and cost more.

19 I would like to add that Units 1 and 2  
20 which are currently under rehabilitation which are  
21 actually my two units, the project is on time, it's on  
22 budget and all the work is getting down. So we can do  
23 some things right.

24 Q. When I was looking at why the costs,  
25 increased, Mr. Burpee, it seems to me that there were

1 three reasons for that, three general reasons. One  
2 might have been as you mentioned, it was simply more  
3 costly to do what you wanted to do; (2) that there was  
4 more work involved to deal with the problems that you  
5 knew about, and I think you mentioned that to some  
6 extent and (3) was finding additional problems. Now  
7 those are three general areas I was thinking up when I  
8 was trying to figure out why the costs would increase.

9 I guess my question to you is, were there  
10 any additional problems that you found when you were  
11 going through this?

12 A. To the best of my recollection I  
13 guess the only real surprise that was found that added  
14 to costs was the amount of cracking found in the  
15 turbine loop pipes which are the high pressure, high  
16 temperature steam lines that are underneath the  
17 turbine, I would judge that to be a surprise that had  
18 to be addressed. But in terms of mechanical condition  
19 I am not aware of too many things that were too much  
20 worse than expected than what the previous inspection  
21 reports found.

22 Q. Just so there is no mistake, I am  
23 referring to the '94 volumes.

24 A. Yes.

25 Q. I am interested in what additional

1 problems you found that weren't mentioned in the '94  
2 volumes?

3 A. The only one that comes directly to  
4 mind is the loop pipes.

5 Now, the '94 volumes is the condition of  
6 the equipment that was inspected. There is a lot of  
7 scope that goes outside what the conditions  
8 assessment -- I have to rephrase that.

9 Condition assessment looked at  
10 reliability problems as well as current conditons and  
11 future needs such as to burn low sulphur coal which  
12 resulted in the work in the backing of the plant on the  
13 precips.

14 MR. MATTSON: What kind of pipe was that?

15 MR. BURPEE: Loop pipe is what was  
16 referred to.

17 MS. PATTERSON: L-O-O-P?

18 MR. BURPEE: Yes. And that's because  
19 they are underneath the turbine. They actually do loop  
20 from the steam chest and into the turbine.

21 MR. WATSON: Q. So, Mr. Burpee, your  
22 evidence is that mostly the cost increase is due to the  
23 fact that it was simply more costly to do what they had  
24 originally intended to do.

25 MR. BURPEE: A. The majority, yes.

1                   Q. I guess most of the balance is that  
2                   there was more work than anticipated to solve the  
3                   problems that you already knew about?

4                   A. Yes.

5                   Q. With one exception, you didn't find  
6                   any additional problems?

7                   A. That's all that have comes to mind  
8                   right now, yes.

9                   MR. MEEHAN: A. He indicated earlier  
10                  that it took longer. So where we were trying to do it  
11                  in nine months, we found that we couldn't do it in nine  
12                  month. The schedule has been extended to 12, or in  
13                  fact 14 months, for the first pair of the units, 5 and  
14                  6. And just by virtue of the fact that you are  
15                  extending the schedule, that increases the cost.

16                  Q. Mr. Burpee, just as a general  
17                  comment, you indicated in the answer to that last  
18                  question, that is what comes to mind right now. I  
19                  assume as you a general rule that if in fact something  
20                  does come to mind while you are still testifying, you  
21                  will let us know.

22                  MR. BURPEE: A. Yes.

23                  Q. Not just while I am cross-examining  
24                  you, but during the course of the panel.

25                  A. Okay.

1 Q. Thank you.

2 Mr. Burpee, I don't want an extensive  
3 review, but I was wondering if you could provide me  
4 with a breakdown with some specific examples of what  
5 actually did cost more, why the costs went up, what  
6 cost more, what areas there was more work than  
7 anticipated and if in fact you come across any  
8 additional problems.

9 I don't want you to reproduce the '94  
10 volumes. If you could, say, on a page give me some  
11 specific examples of those areas and if in fact there  
12 are other areas that I haven't mentioned, if you could  
13 provide that, I would appreciate it.

14 If we could that as the next undertaking,  
15 Mr. Chairman.

16 THE REGISTRAR: 478.6.

17 ---UNDERTAKING NO. 478.6: Ontario Hydro undertakes to  
18 provide specific examples of reasons for  
19 increased work and costs for Units 5 and  
20 6 at Lakeview.

21 MR. WATSON: Q. Now, we were just  
22 looking at Lakeview. If we could look at Lambton,  
23 please.

24 THE CHAIRMAN: I am not sure exactly what  
25 it is. You want him to detail the problems beyond the  
evidence he has already given about the general nature



1 of the problems that they had?

2 MR. WATSON: Yes. For instance, Mr.  
3 Chairman, I was interested in why the cost increase  
4 incurred, and with respect to the general category of  
5 it was simply more costly to do what he had originally  
6 intended, Mr. Burpee mentioned things like asbestos,  
7 increased staffing costs, things like that. I was  
8 wondering if he could provide me with a little more  
9 detailed list, the top five, if you will, or top the  
10 ten items that contributed to that area where it was  
11 more costly to do what they had already intended to do.

12 I certainly don't want him to do an  
13 extensive analysis.

14 THE CHAIRMAN: Are you able to do that  
15 now?

16 MR. BURPEE: I would have to call back.  
17 I am not directly involved with Units 5 and 6. My  
18 Units are 1 and 2. I have an awareness of what went on  
19 and how we revised the scope of Units 1 and 2, so I  
20 would have to get that information from somewhere.

21 MR. WATSON: Q. That is fine, Mr.  
22 Burpee, we have made it an undertaking. You will  
23 recall, I was looking at three general areas where was  
24 more costly to do what you had originally intended to  
25 do, where there was more work than anticipated to solve



1 the problems that you knew about going into the  
2 rehabilitation and the third area was whether there  
3 were additional problems outside of those that you knew  
4 about going into the rehab. Those are three general  
5 areas that I was able to come up with in trying to  
6 figure out why the costs were higher.

7 If there are other general areas and you  
8 can give me some specific examples of those, I would  
9 appreciate that. If I don't hear back from you I will  
10 assume those three areas cover the spectrum.

11 MR. MEEHAN: A. Can I add one thing here  
12 that may be we should bear in mind, is that we had  
13 never done work of this nature to this extent before.  
14 We had no experience and there is very little  
15 experience around. I think that contributed to just a  
16 general increase in the whole project.

17 Q. When you say no experience, you mean  
18 no experience with rehabilitation on this scale?

19 A. That's right, and so we had very  
20 little experience in estimating the cost in the first  
21 place.

22 Q. If we could turn to Lambton, page 18  
23 of Exhibit 479, we find Interrogatory 8.9.54.

24 Mr. Registrar, could I have a number?

25 THE REGISTRAR: 475.6.

1       ---EXHIBIT NO. 475.6: Interrogatory No. 8.9.54.

2                       MR. WATSON: Q. Mr. Meehan, I would like  
3       to go through a similar exercise with respect to  
4       Lambton.

5                       This indicates that the original estimate  
6       to rehabilitate all four units to a high level of  
7       reliability was \$695 million, and that increased to  
8       \$1,150,000,000. Consequently, the work scope was  
9       reduced for all four units to a cost of \$805 million  
10      and less work is planned in the areas relating to  
11      reliability.

12                      If you look at the next page, that's page  
13      19 of Exhibit 479, that is a similar report for  
14      Lambton. In effect, the Lambton rehabilitation report,  
15      and I assume that you will produce that for Mr. Howard  
16      at the lunch break.

17                      I have reproduced page A8 of that. Under  
18      paragraph 9 it talks about the scope of the Lambton  
19      rehabilitation. It says under paragraph A, the work to  
20      ensure continued safe operation amounts to 49 per cent  
21      of the total cost. Under paragraph B, to restore and  
22      ensure an adequate target reliability, 37 per cent of  
23      total cost. And C, to replace equipment approaching  
24      obsolescence, 14 per cent of total cost.

25                      I just did some quick math, Mr. Meehan,

1 and if the original estimate is \$1,150,000,000, the  
2 safety component, which is 49 per cent, would be  
3 approximately \$564 million, and the balance which is  
4 reliability and obsolescence together would be about  
5 \$586 million.

6 Following that through, if you are  
7 currently spending \$805 million and you are doing the  
8 safety part and not doing as much reliability, then the  
9 difference between the 564 for the safety and the 805  
10 for the total is about \$241 million left for the  
11 reliability and obsolescence, which is only about 40  
12 per cent of what you started with.

13 Does that give a --

14 MR. MEEHAN: A. If your arthimetic is  
15 correct, I follow what you are saying.

16 THE CHAIRMAN: Do you know, Mr. Watson,  
17 whether the figures 49 per cent, 37 percentage and 14  
18 per cent relate to the 695 or the 1150 number?

19 MR. MEEHAN: They relate to the 695.

20 THE CHAIRMAN: Does it necessarily follow  
21 that that proportion --

22 MR. MEEHAN: That's true, it does not  
23 necessarily foloww that those same percentages would  
24 apply to the 1150 because of what we have learned in  
25 the meantime between the two estimates.

1 MR. WATSON: Q. Why doesn't it apply?

2 MR. MEEHAN: A. I think it doesn't  
3 necessarily apply because of what we had determined in  
4 the time between the two estimates. We have obviously  
5 learned something, that that has put the costs higher,  
6 based on our Lakeview experience mainly. So we may  
7 have found that those percentages would have changed.  
8 I have never seen the percentages applied to the 1150  
9 number.

10 Q. Okay. So two questions arise from  
11 that, Mr. Meehan. Why did the costs increase and if  
12 those aren't the percentage now, what are the new  
13 percentages?

14 A. The costs increased because of what  
15 we learned at Lakeview primarily.

16 Q. So, in effect you took the Lakeview  
17 experience and just applied a factor to the Lambton  
18 number. You didn't look at the Lambton assessments and  
19 redo them?

20 MR. BURPEE: A. No, what was learned  
21 from Lakeview in terms of costs to do a particular job  
22 was then applied to Lambton.

23 Q. You recosted it?

24 A. So recosted it based on our  
25 experience with asbestos removal, with replacing

1 controls, et cetera.

2 Q. So the second part, Mr. Meehan, do  
3 you have percentage figures for the new estimate?

4 MR. MEEHAN: A. I have never seen  
5 percentage figures for the new estimate.

6 When we did see that new estimate we took  
7 some action to cut back on the scope of that job and  
8 the Lakeview job. We didn't do an awful lot more work  
9 on the 1150 estimate.

10 Q. When you said you took steps to cut  
11 back on the work, that is talking about cutting back on  
12 the reliability work?

13 A. Mainly.

14 Q. So, my figures using the old estimate  
15 show that you are only spending about 40 per cent of  
16 what you had originally anticipated spending on  
17 reliability. Is that still in the ballpark?

18 A. It could be in the ballpark. I'm not  
19 sure, but it could very well be in the ballpark.

20 Most of the work we have cut back on is  
21 in terms of reliability. We are doing the safety and  
22 all the environmental stuff that we were intending to  
23 do. So yes, it's the reliability that's been cut back.

24 Q. Okay.

25 MR. BURPEE: A. I would like to point



1 out that we have nice distinct chunks of work here but  
2 that's not the way it is. A lot of safety related  
3 impact on reliability. In other words, if you protect  
4 against a pressure vessel or steam line rupture and  
5 killing several people, also if it did rupture you  
6 would have to replace it and it would be unreliable.

7 So it's not distinct black and white,  
8 which is which, they flowed into each other. And the  
9 same is with equipment approaching obsolescence, it's  
10 the spare parts issue that also impacts on future  
11 reliability, and that's what the decisions are made on  
12 as well.

13 Q. So, Mr. Meehan, in answer to my  
14 question you said that it could be 40 per cent.

15 What sort of range are we looking at  
16 there? Could it be as low has 30 per cent or 20 per  
17 cent of what you are originally planning on spending  
18 on --

19 MR. MEEHAN: A. I really don't know what  
20 it would be.

21 Q. What is your best guess?

22 A. I hesitate to guess as to what it is.

23 Q. Could you find out for me then,  
24 please, Mr. Meehan? I don't want to you guess, or Mr.  
25 Burpee, could you find out what you are spending on



1 reliability and what percentage that is of what you  
2 originally intended to spend on reliability?

3 A. Are you asking that it be applied to  
4 the 1150 number or which number are you asking for the  
5 percentage of it?

6 Q. 1150 is the reality; isn't that  
7 correct?

8 A. If we were going for the high level  
9 of reliability, that's true. We haven't done any work  
10 on that estimate for the past year again. So, it would  
11 be a big undertaking to attempt to, in view of what Mr.  
12 Burpee just said, because of the interlinking of all of  
13 these topics,it would be a big job to produce that  
14 against the 1150 estimate in particular.

15 [12:29 p.m.]

16 THE CHAIRMAN: Can we start this way? If  
17 there has been an analysis, as there was on page 19, of  
18 the compartmentalizing of these costs into the safety,  
19 reliability and replacement of equipment, there has  
20 been such an analysis of the 1150 figure, that can be  
21 produced.

22 I take it that there is obviously some  
23 overlapping. But am I right in assuming that you say  
24 okay, we're going to spend some money on safety, and  
25 that may have some collateral effect which will impinge

1 on reliability, but there may be other expenditures  
2 which are entirely reliability related? So is that  
3 what you mean?

4 MR. MEEHAN: That's true, yes.

5 MR. WATSON: And, Mr. Chairman, that's  
6 what I'd like the estimate of.

7 THE CHAIRMAN: If it exists. Now he says  
8 if it hasn't been done, it's a big job.

9 MR. WATSON: Well, my understanding, Mr.  
10 Chairman, is they know what they're going to do on  
11 reliability, and I hope they have a cost for that  
12 already. So that's the first part.

13 And the second part, I guess, is what  
14 we're talking about. The 1150, what we need would be  
15 some approximation or some estimate or their best  
16 estimate as to what part of that 1150 was for  
17 reliability.

18 THE CHAIRMAN: Mr. Howard?

19 MR. HOWARD: As I understand it, Mr.  
20 Chairman, what's being asked for, if there is an  
21 existing estimate of how much of the 1150 was for  
22 reliability. And I would add voluntarily to that, if  
23 there is an existing estimate of the current 805, how  
24 much of that is reliability, then perhaps we'll have  
25 some meaningful numbers. But we do not at this stage,

1 at least until the Board directs to undertake to make  
2 such an estimate, if it hasn't been done, that is  
3 satisfactory.

4 THE CHAIRMAN: Well, I guess the question  
5 should be addressed to Mr. Watson.

6 MR. WATSON: Well, through you, Mr.  
7 Chairman, there's no doubt that trying to get a very  
8 fine estimate of what exactly is reliability and what  
9 exactly is safety is very difficult.

10 However, what I'm interested in is  
11 exactly what you were referring to; an idea of how much  
12 was pigeonholed into the reliability area with respect  
13 to the 805 and the 1150. And there must be some Hydro  
14 cost estimates which can be referred to.

15 They can look at expenditures for  
16 boilers, tubes, determine if in fact some were for  
17 reliability, some were for safety, and that's in effect  
18 what I want to do. I want to find out how much they  
19 are spending on reliability, how much they thought they  
20 had to spend, and what the difference is.

21 THE CHAIRMAN: Well, they did it once.  
22 Whether they did it again, we'll have to find out. But  
23 if they can do it without a great deal of difficulty,  
24 that's what they should do. If they have a great deal  
25 of difficulty, then they can come back and we can

1       revisit it.

2                   MR. WATSON: Thank you, Mr. Chairman.

3                   Q. Mr. Meehan, you mentioned the 1150  
4       estimate was a year old. Do you have any concern that  
5       that estimate now should be increased?

6                   MR. MEEHAN: A. No, I have no indication  
7       one way or the other. We have -- we've gone right away  
8       from doing that kind, that scope of work at that  
9       station. So that, the work that was done there has  
10      come to a dead end over a year ago.

11                  Q. Just before I leave this area, Mr.  
12      Meehan, I asked you when we were talking about Lakeview  
13      about the difference between the -- no, I'll pass on  
14      that. Thank you, Mr. Meehan.

15                  MR. HOWARD: Just before my friend goes  
16      on to the next topic, I've been told that we didn't get  
17      an undertaking number for rehabilitation content of  
18      1150 and 805.

19                  THE CHAIRMAN: We need another one.

20                  THE REGISTRAR: 478.7.

21                  THE CHAIRMAN: Thank you.

22      ---UNDERTAKING NO. 478.7: Ontario Hydro undertakes to  
23                              produce the reliability content for No.  
                                  1150 and No. 805.

24                  THE CHAIRMAN: Thank you, Mr. Howard.

25                  MR. WATSON: Mr. Howard just said

1 rehabilitation content, I think he meant reliability.

2 MR. HOWARD: Yes, I'm sorry. I'm not  
3 very reliable.

4 THE CHAIRMAN: Reporters are. They're  
5 very good at summarizing what the undertakings are.

6 MR. WATSON: Q. Now, Mr. Meehan, Lambton  
7 is one of the stations you're planning on considering  
8 for life extension. Now you're not completely  
9 rehabilitating this station, and my client's concern is  
10 that if you are not completely rehabilitating this  
11 station, especially with respect to reliability, then  
12 how can it be considered for life extension?

13 MR. MEEHAN: A. Following the  
14 rehabilitation, we will enter a life management program  
15 for Lambton, and that's an essential requirement to  
16 life extension in any event.

17 Q. Can you tell us how much money you  
18 are going to spend on that life management program, Mr.  
19 Meehan?

20 THE CHAIRMAN: Just for Lambton you are  
21 talking about?

22 MR. WATSON: Yes.

23 MR. MEEHAN: And is this prior to year  
24 40, or following --

25 MR. WATSON: Q. You said after the



1 rehabilitation program you are going to enter into a  
2 life management program.

3 MR. MEEHAN: A. That's correct.

4 Q. I assumed that that was right after  
5 rehabilitation there was an ongoing life management  
6 program through to the end of its life. Is that not  
7 correct?

8 MR. BURPEE: A. No, the number right now  
9 that we've quoted that's in the update is to do the  
10 inspections at seven and a half per cent of the  
11 variable OM&A, which depends on the capacity factor the  
12 station is going to run.

13 That's to do the inspections and group  
14 cost analysis and determine what's required. We have  
15 not yet fully determined say the cost or the  
16 reinvestment up to year 40, although we have some idea  
17 of what it will be, and we do have a value for that.  
18 But it won't be until they are farther in terms of  
19 the -- down the road in terms of all the inspections  
20 being in. Keep in mind Lambton's inspections are just  
21 starting next month, when the first units are down for  
22 rehab, as to what the required capital or OM&A  
23 reinvestments required over a period of time to give  
24 the required performance.

25 Q. Well, just so I understand what you



1 are saying, Mr. Burpee, what you have described as a  
2 life management program up until the year 40 of  
3 Lambton's life is in effect an inspection, an analysis  
4 program?

5 A. That's the only --

6 Q. And that life management program does  
7 not include any capital costs to fix some of the things  
8 that you find in your inspection program.

9 MR. MEEHAN: A. At the time the decision  
10 was taken to do the reduced rehabilitation at Lambton,  
11 I believe the figure that was used in the analysis was  
12 \$12 million a year in additional OM&A and capital. And  
13 that was as part of the package of the reduced  
14 reliability, in order to hold the reliability, at a  
15 lower level even. I believe \$12 million, in the order  
16 of \$12 million a year on average in additional OM&A and  
17 capital expenditure was required to year 40.

18 Following year 40, as the update document  
19 Exhibit 452 indicates, approximately \$3 million, \$3  
20 million per unit beyond year 40 would be required.  
21 Again, that's \$12 million.

22 The document, I believe that's been  
23 corrected, but the document says \$3 million per  
24 station. It should read \$3 million per unit. And that  
25 is --

1 Q. That's page 13 of Exhibit 4 --

2 A. That's page 13, about the centre of  
3 the page.

4 Q. Under the heading "Cost of  
5 Maintaining Existing Fossil Units in Operation." And  
6 you are saying so now in effect that figure should be  
7 \$12 million per year -- sorry \$3 million per year per  
8 unit. So for Lambton that would be \$12 million per  
9 year?

10 A. Yes.

11 Q. But that's beginning in the 40th  
12 year?

13 A. Yes. But at the time the decision  
14 was taken to go to the reduced scope at Lambton, I  
15 believe the number to get to year 40 was also \$12  
16 million per station is the way it was put then. So  
17 it's essentially the same.

18 MR. BURPEE: A. It's 9 million.

19 MR. MEEHAN: A. I'm being corrected  
20 here. It was \$9 million a year.

21 Q. And that's at the reduced reliability  
22 figure.

23 A. Yes.

24 MR. BURPEE: A. Slightly reduced.

25 THE CHAIRMAN: That's the figure you've

1       used, 9?

2                   MR. BURPEE: Nine million.

3                   MR. MEEHAN: Yes, Mr. Chairman.

4                   MR. BURPEE: OM&A and capital combined,  
5       averaged over the roughly 20 years.

6                   MR. WATSON: Q. And again, just so that  
7       there is no confusion, that \$9 million is for the life  
8       management program, that's the inspection, the  
9       analysis, and then doing the capital investments that  
10      fall out of that inspection and analysis?

11                  MR. BURPEE: A. That's correct.

12                  Q. And that \$9 million, that's an  
13      estimate that was made at the time of looking at the  
14      cost of \$805 million for Lambton, is that --

15                  A. That's correct.

16                  Q. And that estimate of \$9 million, that  
17      was prior to the decision to life extend the plants.

18                  A. Yes, but not prior to the decision of  
19      having -- well, I shouldn't say decision. The station  
20      was being positioned, all stations were being  
21      positioned to take up life management programs. So the  
22      stations within thermal operations. It's a road we  
23      have been going for a few years working towards that.  
24      It's more critical now with the view of life extension.  
25      You have to have life management. It is a route that

1 we were going down.

2 Q. Your evidence is that at the time of  
3 this estimate, Hydro was already positioning itself to  
4 life extend their units?

5 A. We were looking at it. When I say  
6 positioning, I'm not sure you could say Hydro was. In  
7 thermal operations we were looking at. It had not been  
8 formally adopted by Hydro as a corporation at that  
9 time. We were looking at it. So there's not an  
10 official corporate decision.

11 Q. Who was looking at it?

12 A. Within thermal operations.

13 Q. The thermal operations division was  
14 looking at --

15 A. Thermal generation division. Because  
16 that was also at the time that Lambton -- or sorry, the  
17 Nanticoke life management program was put forward.

18 Q. And, Mr. Burpee, pardon my surprise,  
19 but you have probably reviewed the transcripts for  
20 Panel 2. There is certainly no indication of that at  
21 any place in the transcripts in Panel 2.

22 A. Well, as I said, it was not a  
23 corporate decision at that time.

24 MR. MEEHAN: A. I think the first  
25 corporate decision with respect to life management

1 occurred about July or August, when the first stage of  
2 the program for Nanticoke was put forward to the Board.  
3 So until then it wasn't really an accepted philosophy.

4 The philosophy developed out of our  
5 experiences with Lakeview and Lambton rehabilitations.  
6 We weren't too happy with what those kinds of projects  
7 were costing us. They were costing us those kinds of  
8 dollars, because we had let the stations get rundown.  
9 And so over the past few years, the ideas in the  
10 industry of life managing a facility, it's only in the  
11 last two or three years that I've been aware of -- the  
12 last two years, I guess, that I've been aware of the  
13 term life management. I don't think it will be used in  
14 any of the Lambton or Lakeview documents, although it  
15 could have snuck into the Lambton document.

16 So it's a recent, it's a recent  
17 philosophy with respect to how you get the most out of  
18 your existing facilities.

19 MR. BURPEE: A. I should also be clear,  
20 when the number came up for Lambton, no one said, "Well  
21 now we will put in life management, it will be \$9  
22 million a year." But the process they went when the  
23 scope of the rehab was cut back was to say, "What kind  
24 of things? What kind of reinvestment will be required  
25 to recover some of the reliability that would be lost



1 from the reduction in scope?" And what they have said  
2 is, and they did determine roughly if they had \$9  
3 million a year in a continued period, they could  
4 control the reliability. What that is a life  
5 management program.

6 So they didn't consciously say, "Well, we  
7 will cut it back. We will put life management in."  
8 But the process that they went through is what we now  
9 refer to as life management.

10 Q. But at that time the Depreciation  
11 Review Committee was recommending a 40 year life,  
12 system planning was planning on a 40 year life.

13 MR. MEEHAN: A. And we were talking life  
14 management to year 40 through this period.

15 Q. And that was the origin of the \$9  
16 million figure?

17 A. Yes.

18 MR. BURPEE: A. Yes.

19 DR. CONNELL: Can I just understand, does  
20 that \$9 million figure incorporate any of the costs of  
21 decommissioning?

22 MR. BURPEE: No.

23 MR. MEEHAN: No, I wouldn't think it  
24 does. It's a rough estimate of the cost that we would  
25 expect to incur, in addition to what we would have



1 incurred had we done a full rehabilitation job, done  
2 the full scope work at Lambton. We've cut back on  
3 reliability. Therefore if we're going to maintain even  
4 the lower level of reliability that we're targeting on,  
5 we will have to change out some of the parts years  
6 later, rather than doing them in the rehabilitation.  
7 And the average cost of that is expected to be \$9  
8 million a year over the period to the 40 year life.

9 MR. WATSON: Q. And so getting back to  
10 my original question, that \$9 million a year is going  
11 to be sufficient, even though you are not completely  
12 rehabilitating the plant at this time, especially with  
13 respect to reliability?

14 MR. MEEHAN: A. Sufficient for? In  
15 addition --

16 Q. To take you into life extension.

17 A. Yes. That's the estimate.

18 MR. BURPEE: A. And also there is some  
19 variance with energy. I don't even know what energy  
20 that was planned on. Probably a high capacity factor.  
21 But if the station utilization drops, then it doesn't  
22 cost as much.

23 We keep talking in terms of years, but  
24 what's critical to the station or to the equipment is  
25 hours of operation more than anything else. So the

1 plant runs at a low operating factor, well, then  
2 doesn't need as much work as if it's at a high  
3 operating factor in terms of reinvestment.

4 Q. So what you are really talking about  
5 then is what role it's going to assume?

6 A. Correct.

7 Q. And for your fossil units, you are  
8 assuming that they will not be base load, they will be  
9 intermediate or peaking?

10 MR. MEEHAN: A. Generally speaking  
11 that's true. It will depend. Once scrubbers are  
12 installed on Lambton, it will run at high intermediate  
13 likely. But once scrubbers are installed on all our  
14 large fossil units, then there would be no point in  
15 seeing that Lambton takes the heavier share. So it  
16 would drop down to intermediate or low intermediate  
17 usage, and Lakeview would be in a peaking role.

18 Q. Mr. Meehan, Mr. Burpee, if you could  
19 turn back to page 4 of Exhibit 479, the fourth  
20 paragraph, the one that starts "Key considerations for  
21 the extension..."

22 We have talked about the first three  
23 points there. The fourth point is acid gas management.  
24 And again, we are talking about the key considerations  
25 for the extension of the service lives of these fossil

1 stations. And the committee feels that acid gas  
2 management is a key consideration.

3 Now, isn't it fair to say that the trend  
4 is that acid gas regulations are more strict, and that  
5 this trend is expected to continue?

6 A. That's true.

7 Q. And isn't that going to have a  
8 substantial affect on life extending these plants?

9 A. It can have, depending on how that is  
10 handled. First of all, I think we should continue to  
11 bear in mind that the life extension we're talking  
12 about by looking at this page, with respect to Lambton  
13 and Nanticoke, is going from 35 years to 40 years.  
14 That's the life extension that is being discussed here.

15 And with reference to the acid gas  
16 management, I think it may be referring to the fact  
17 that the regulation that we were having to comply to is  
18 an umbrella regulation and not a specific station  
19 regulation, and we could see ourselves meeting that  
20 regulation and forecast regulations for that additional  
21 five-year period.

22 [12:50 a.m.]

23 Q. And the last factor that was  
24 mentioned was the location and expected mode of  
25 operation of existing fossil generating stations.

1       There has been no change in that factor between when  
2       Panel 2 testified and today; is that correct?

3                   A.   I'm not too sure about that one.

4                   Q.   Locations are still the same.

5                   A.   Locations are certainly still the  
6       same.

7                   Generally speaking, I would say that the  
8       mode of operation is unchanged.

9                   Lakeview I am sure at this time was -- or  
10       at the time Panel 2 sat, Lakeview was seen as being a  
11       peaking type of operation and the other two were  
12       running as intermediate.

13                  Q.   Following down that page, Mr. Meehan,  
14       the second last paragraph that starts with the words  
15       "given current energy", that paragraphs reads:

16                  Given current energy need projections,  
17                  capacity equivalent to Lakeview TGS's  
18                  output is expected to be required beyond  
19                  1996. It is considered that  
20                  rehabilitating Lakeview is the best way  
21                  to supply the required capacity given the  
22                  estimated cost of rehabilitating the  
23                  station, relatively short lead time  
24                  available to require new generation and  
25                  current allowances for other types of

1 demand/supply options.

2 I was looking at the fourth line, Mr.  
3 Meehan, and I was looking at words "required capacity",  
4 the best way to supply the required capacity. Now, as  
5 I understand Exhibit 452, Hydro is protecting a surplus  
6 which is going to peak at about 5,000 megawatts in the  
7 year 2000. If there is that surplus then aren't we  
8 into a situation where instead of rehabilitating these  
9 units and life extending them, shouldn't we be talking  
10 about mothballing these units?

11 A. The Lakeview units?

12 Q. Let's start with Lakeview.

13 A. That's what it's referring to.

14 Q. Yes.

15 A. I would think that's one of the  
16 things that we would be considering and I believe it  
17 may suggest that in Exhibit 452, that not using all of  
18 Lakeview is one way of managing that surplus. But  
19 these are things that are under study right now.

20 Q. You are quite right, Mr. Meehan, you  
21 are mentioning at page 23, mothballing two of the units  
22 and cancelling the rehabilitation of the last four, but  
23 I want to take it a little further.

24 First of all, we know that mothballing  
25 reduces current OM&A; correct?



1 A. I'm sorry, it reduces?

2 Q. Current OM&A.

3 A. If you don't pay the salaries, I

4 would think it would reduce the OM&A.

5 Q. Well, salaries aren't the only

6 expense.

7 A. That's true.

8 Q. And for those other expenses it's

9 going to reduce that OM&A; isn't that fair?

10 A. Yes.

11 Q. And in particular, just so there is  
12 no confusion on this point, Mr. Meehan, if you look at  
13 page 20 of my exhibit, which is Interrogatory 8.9.41.

14 Mr. Registrar?

15 THE REGISTRAR: 475.7.

16 ---EXHIBIT NO. 475.7: Interrogatory No. 8.9.41.

17 MR. WATSON: Q. We asked an  
18 interrogatory about the cost to maintain a mothballed  
19 unit, and Hydro's answer was that the cost of  
20 maintaining the Lennox generating station in the  
21 mothballed condition was about 5 per cent of the cost  
22 of operating the station. Is that a fair  
23 generalization, that mothballing is less expensive and  
24 saves money?

25 MR. MEEHAN: A. It certainly would be



1 less expensive than operating it and it would certainly  
2 cost money. I can't debate the 5 per cent figure.

3 Q. Thank you.

4 A. It's probably right.

5 Q. The other thing that mothballing  
6 would do, it would reduce your rehabilitation expenses  
7 and in some way might even go a long distance to  
8 eliminate them; isn't that fair?

9 A. That's true. We could mothball units  
10 in the condition they are in, if they are in poor  
11 condition we could mothball them in that condition.

12 Q. Of course the advantage of that is,  
13 if you are going to do the rehabilitation anyway, if  
14 the unit has to be brought back in 10 years or 15  
15 years, whatever, you would have a much better idea of  
16 what the costs would be, you would also have a better  
17 idea of the need, and on top of all that you would have  
18 the advantage of any new technology.

19 Isn't all of that fair, Mr. Meehan?

20 A. Certainly all of those things would  
21 be considered, yes.

22 Q. And also looking at the mothball  
23 option, the next page, page 21 of my exhibit shows  
24 Interrogatory 8.9.40.

25 Mr. Registrar, if we could have a number?

1 THE REGISTRAR: 475.8.

2 ---EXHIBIT NO. 475.8: Interrogatory No. 8.9.40.

3 MR. WATSON: Q. That interrogatory talks  
4 about the reduced rate at which equipment deterioration  
5 takes place, and that's a factor to be considered in  
6 mothballing; isn't that fair?

7 MR. MEEHAN: A. Yes, you would want to  
8 consider that.

9 Q. So, if in fact there is a capacity  
10 surplus which is forecast, doesn't it make sense to  
11 seriously consider mothballing units, then if the  
12 capacity is needed in the future you can demothball  
13 them and do whatever service makes sense at that time?  
14 And in fact you have done that in the past; haven't  
15 you?

16 A. Yes, we have done that and it makes  
17 good sense to consider these things along with whatever  
18 other things you might have to do as well. You may  
19 have other alternatives that you might consider in  
20 managing the surplus and I believe there is a list of  
21 those things on page 22 of Exhibit 452, and all of  
22 these things are being considered.

23 Q. This morning we have seen an  
24 estimate, a rough estimate of some of the costs that  
25 are involved in rehabilitating these units. We are

1 talking hundreds of millions of dollars. Lambton is  
2 over 800 million, Lakeview is over 800 million. And  
3 you quite rightly refer to these alternatives and I was  
4 going to refer you to them as well. I have been trying  
5 to point out the advantages of mothballing.

6 Where is Hydro's cost analysis which  
7 tells us the worth of one-and-a-half or \$2 billion in  
8 rehab when mothballing is a serious option and how is  
9 that related to some these others? Where are the cost  
10 estimates, and if they aren't there, how are these  
11 decisions being made? Because you are spending money  
12 on rehabilitation today.

13 A. Yes, and those decisions were taken a  
14 year or more ago, I guess.

15 Are you suggesting that we should be  
16 questioning these decisions?

17 Q. Very much so.

18 A. Well, they may be part of managing  
19 the surplus assessments that are being underway. I  
20 don't know.

21 Q. Is there any cost analysis? Is there  
22 any analysis?

23 A. Not that I am aware of.

24 This matter is not necessarily just a  
25 fossil planning matter; it's a system planning matter

1 perhaps that maybe should be dealt with by others. I  
2 am not aware of how they are looking at those various  
3 options to manage the surplus.

4 Q. Well, you will agree with me this  
5 far, money is being spent, substantial money is being  
6 spend on the rehabilitation right now. That has a  
7 direct impact on the decision to mothball the units,  
8 mothballing is some way to handle the surplus,  
9 according to Hydro there is a surplus --

10 A. I contend that we are already taking  
11 steps to deal with exactly what you are talking about.  
12 By virtue of the fact that we have slowed down the --  
13 we have reduced the scope drastically at Lakeview, we  
14 are limiting it to the repair of four units, that is a  
15 decision we took a year ago. And we did in fact, when  
16 we saw the costs going to where they were, we did the  
17 assessment at that time to decide what it was to do,  
18 and the decision that we took at that time was to stop  
19 the rehabilitation on four of those units and try to  
20 decide what we should be doing with them. So we have  
21 taken that step.

22 Q. But that was prior to the update?

23 A. That was prior to the update. That  
24 was about one year ago.

25 Q. And you are unaware of any analysis

1 with respect to what should occur as a result of that  
2 update with respect to mothballing these units and  
3 rehabilitating them?

4 A. I am unaware of what is being done in  
5 that respect.

6 MR. WATSON: Mr. Chairman, I note that  
7 it is one o'clock, you indicated that you wanted to  
8 rise for the day at one o'clock.

9 THE CHAIRMAN: That's right. We will  
10 adjourn then until tomorrow morning at ten o'clock.

11 You will be followed by Mr. Rodger; is  
12 that right?

13 MR. RODGER: That's right.

14 THE CHAIRMAN: And then Mr. Cuyler; is  
15 that right?

16 All right.

17 THE REGISTRAR: Please come to order.  
18 This hearing will adjourn until ten o'clock tomorrow  
19 morning.

20 ---Whereupon the hearing was adjourned at 1:00 p.m. to  
21 be resumed on Thursday, February 20, 1992, at 9:00  
a.m.

22  
23  
24  
25 JAS/RT [c. copyright 1985]







E R R A T A  
and  
C H A N G E S

To: Volume 93

Date: Monday, December 16, 1991.

<u>Page No.</u>	<u>Line No.</u>	<u>Discrepancy</u>
16535	2 + 3	6.3.118 s/r <u>6.33.118</u>

Volume 102

17983	3	4.7 s/r 47
-------	---	------------







3 1761 1146554 8